Manuals Menu

Repair Parts Catalog

Welch Allyn

Service Manual

Traditional Instruments

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Welch Allyn
Service Manual
Traditional Instruments
PN 117081-1

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A	New Release	5-34434	1/10/97	R. Settembre
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Drawings and/or illustrations and/or part numbers contained in this document are for reference purposes only. For current revisions call Welch Allyn Customer Service 1-800-535-6663.

If during servicing these products, you require further technical assistance, call Welch Allyn.

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OPHTHALMOSCOPES

Special Instructions Ophthalmoscope Service:

Clean all returned ophthalmoscopes by wiping with a solution of 10% Clorox / 90% water. Do not apply alcohol, chemicals or water to the mirror or lenses. Follow disassembly and assembly sequences as printed. Disassembly of the Optical Tube Base is not recommended or covered by this Service Manual. Always begin service work with a thorough understanding of the customer's complaint and its cause. Avoid overtightening of fasteners by applying light tightening torque.

Notes:

1. "*SLP*" means "Small Loose Parts" and cautions you to disassemble carefully, reducing the chances of losing small, possibly spring-loaded, parts.
2. Use T-10913 for loosening the lock ring.
3. Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog PN 900299.

A. 11110 2.5 Volt Halogen Lite Set ™ Ophthalmoscope Disassembly:

A1	Lamp	--	Pull lamp from bottom of optical tube.
A2	Bumper	--	Pull corner, peel back.
A3	Cover Ass'y (Doctor-side)	--	Loosen retaining ring.
A4	2 Screws	--	Un-screw 2 screws, (torx 05). Remove cover assembly (doctor-side) *SLP*. Remove (from doctor-side cover): lens disc, lens dial index spring, magnifier lens.

A. 11110 2.5 V Halogen Lite Set™ Ophthalmoscope Cont'd:

A5	Ophthalmoscope Body Assembly	--	Remove:	Horseshoe (PN111026) Numeral Illuminator Aperture Disc Assembly Index Spring 2 Screws (Holding the lens holder ass'y) Lens Holder Assembly Filter Housing and Filter ***** Optical Tube Base *****Filter is easily scratched.

**** 11110 Reassembly ****

A6	Ophthalmoscope Body Assembly	--	Insert optical tube base assembly into ophthalmoscope body. Inspect filter over shiny metal surface and look through filter at its own shadow. One side will show a 'blue' tint. Place tint side of the filter towards the inside of the scope during reassembly. When using new replacement filter, remove protective polyethylene films 2 sides. Insert filter into filter housing and place into ophthalmoscope body with filter housing finger tab towards top of the scope. Place lens holder assembly into position and fasten with 2 screws. Place index spring onto raised anchor. Rounded indexing spring end should face the hub. Place aperture disc assembly onto hub with apertures at bottom. Place numeral illuminator on top of the center of the aperture disc assembly with pivot in hole at base. Place horseshoe over numeral illuminator with open end of horseshoe at top as shown in parts diagram and notch directly over numeral illuminator.
A7	Cover Assembly (Doctor Side)	--	Place lens dial index spring onto the raise anchor. (Rounded end of indexing spring towards lens disc assembly hub).
A8	Lens Disc Assy.	--	Clean disc. Place disc on hub. (Number side down) engage with detent.
A9	Cover Ass'y (Doctor Side)	--	Place cover onto ophthalmoscope body assembly. Place ring onto base with numbers "128" right-side-up. Tighten ring, screws. Install bumper.
A10	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.

End 11110 Reassembly

B 11400 and 11411 2.5 Volt Ophthalmoscope Disassembly:

B1	Bumper	--	Pull corner, peel back.
B2	Back Cover (Doctor-side)	--	Loosen and remove retaining ring.
B3	2 Screws	--	Remove 2 screws, (torx .05) separate covers. *SLP* Remove (from doctor-side cover):lens disc, center hub (metal) indexing spring, lens retainer, magnifying lens.
B4	Housing (Patient-side)	--	Separate housing from optical tube base assembly.
B5	Lamp	--	Pull lamp from bottom of optical tube.

**** 11400 and 11411 Reassembly ****

B6	Cover (Patient-side)	--	Insert optical tube base assembly.
B7	Indexing Spring	--	Place spring into position below bumper cut-out of doctor-side cover. (Return bend on left side)
B8	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
B9	Lens Retainer	--	Place lens retainer on top of lens.
B10	Lens Disc Ass'y.	--	Clean disc. Place disc in cover. (Number side down, engaged with detent) place hub in center of lens disc (small pivot side up).
B11	Cover	--	Place cover onto patient-sidecover/optical tube base assembly. Install and tighten ring (undercut knurl or smooth edge at bottom) screws. Install bumper.
B12	Lamp	--	(Only halogen lamps are available for the 14000). Align pin of lamp into groove of lamp socket and press lamp in. Test.

End 11400 and 11411

C 11470 and 11475 2.5 Volt Ophthalmoscope Disassembly:

C1	Bumper	--	Pull corner, peel back.
C2	Back Cover (Doctor-side)	--	Loosen and remove retaining ring.
C3	2 Screws	--	Remove 2 screws, (torx .05) separate halves.*SLP*. Remove (from doctor-side cover): lens disc, indexing spring and button, lens retainer, magnifying lens.
C4	Housing (Patient-side)	--	Separate housing from optical tube base assembly.
C5	Lamp	--	Pull lamp from bottom of optical tube.

**** 11470 and 11475 Reassembly ****

C6	Cover (Patient-Side)	--	Insert un-printed plug (tabs pointing to top of instrument), optical tube base assembly.
C7	Indexing spring	--	Place spring into position below bumper cut-out of doctor-side cover. (2 tabs on spring facing down).
C8	Indexing Button	--	Place button, into guides beneath spring, flat side to spring.
C9	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
C10	Lens Retainer	--	Place lens retainer on top of lens.
C11	Lens Disc Ass'y.	--	Clean disc. Place disc in cover. (Number side down, engaged with detent)
C12	Cover (Doctor-Side)	--	Place cover onto patient-side cover/optical tube base assembly. Install and tighten ring (undercut knurl or smooth edge at bottom), screws. Install bumper.
C13	Lamp	--	Align pin of lamp into groove of lamp socket and press in. Test.

End 11470 and 11475

D 11500 and 11511 2.5 Volt Ophthalmoscope Disassembly:

D1	Rubber Hood	--	Pull corner, lift up.
D2	Light Carrier Assembly	--	Pry/pull out light carrier assembly and remove condensing lens and lamp.
D3	Back Cover (Doctor-Side)	--	Loosen/remove set screw first and then ring nut. (Use .035" hex key). Remove light carrier retaining spring from ring nut if damaged. Remove base. Remove cover. *SLP* (Glass lens PN106006)
D4	Ophthalmoscope Body	--	Remove lens disc and small glass lens. Do not remove aperture assembly disc now. Clean lens disc. Check tightness of the three small brass screws in center of lens disc. (Do not disassemble lens disc) *SLP* clean in ultrasonic bath. Optional upgrade: Replace multi-lens disc with acrylic lens disc. Remove clear plastic washer (.76" or 19.4mm outside diameter / .45" or 11.58mm inside diameter, PN 106017) brass insert (disc) from hub. Remove lens disc indexing spring detent at top. Un-screw screws from mirror holder assembly, and remove mirror assembly.
D5	Aperture Ass'y	--	Pull aperture assembly (disc) straight up. Remove small detent spring, clear plastic spacer (.75" or 19.19 mm outside diameter / .223" or 5.67 mm inside diameter, PN 106019; not found on all 115 scopes)

**** 11500 and 11511 Reassembly ****

D6	Ophthalmoscope Body	--	Insert both detent springs (top spring return bend to the left; bottom spring return bend to the right). Place clear plastic spacer (small hole) onto hub. Place aperture disc ass'y on hub (engage detent spring). Place mirror holder assembly over edge of aperture disc and fasten with 2 screws. Place clear plastic washer (large hole) and hub insert onto mirror holder assembly hub.

D 11500 and 11511 2.5 Volt Ophthalmoscope Reassembly:

D7	Lens Disc Ass'y	--	Place lens disc assembly onto hub (number side up) and engage in detent. Optional upgrade: Acrylic disc PN 116041-502.
D8	Magnifying Lens	--	Place lens (flat side onto lens disc) onto horizontal lens disc and position it over the bottom-most number. This will line up with opening in doctor-side cover. Gently engage and lower doctor-side cover onto the ophthalmoscope body assembly and magnifying lens. Make sure the lens is still aligned to fit into the hole in the doctor-side cover. Do not chip or scratch the magnifying lens.
D9	Base	--	Install base. Temporarily engage the base set screw into the hole in bottom of scope casting. Install light carrier retaining spring onto base retaining ring nut, and screw the ring nut into the base (use Welch Allyn wrench T-11896). Do not thread ring nut into the base if the set screw extends into the thread area. This will damage set screw and ring nut. Make sure the set screw will not interfere with the ring nut by first partially unscrewing the set screw. Then tighten the ring nut. Tighten set screw and inspect for burrs on set screw head. Install rubber hood.
D10	Light Carrier	--	Clean lamp, lens. Install lamp into light carrier. Engage alignment pin of lamp into groove of lamp socket. Slide condensing lens assembly over lamp. Insert light carrier into base of scope. Test.

End 11500 and 11511

E 11600 3.5 Volt Halogen Ophthalmoscope Disassembly:

E1	Bumper	--	Pull corner, peel back.
E2	Back Cover (Doctor-Side)	--	Loosen retaining ring.
E3	2 Screws	--	Remove 2 screws, (torx .05) separate halves. *SLP* From the doctor-side cover, remove: Lens disc, center hub (metal) indexing spring, magnifying lens. (Early11600 models have separate glass lenses (23) in lens disc, and a glass magnifying lens.) Do not disassemble lens disc for cleaning.*SLP* Clean in ultrasonic bath. Optional upgrade: replace glass lens assembly with acrylic lens disc, new cover acrylic magnifying lens.
E4	Housing (Patient-side)	--	Separate housing from optical tube base assembly.
E5	Lamp	--	Pull lamp from bottom of optical tube.

**** 11600 Reassembly ****

E6	Cover (Patient-side)	--	Insert optical tube base assembly.
E7	Indexing Spring	--	Place spring into position below bumper cut-out of doctor-side cover. (Return bend on left side)
E8	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
E9	Lens Disc Ass'y	--	Clean disc. Check tightness of 3 small brass screws on disc. Do not unscrew these 3 screws. Place disc in cover with number side down and engaged with detent. Place hub in center of lens disc (small pivot side up)
E10	Cover (Doctor-Side)	--	Place cover onto patient-side cover/optical tube base assembly. Tighten ring, screws. Install bumper.
E11	Lamp	--	Align pin if lamp into groove of lamp socket and press lamp in. Test.

End 11600

F 11605 3.5 Volt Halogen Ophthalmoscope Disassembly:

F1	Bumper	--	Pull corner, peel back.
F2	Back Cover (Doctor-Side)	--	Loosen retaining ring.
F3	2 Screws	--	Un-screw 2 screws, (torx .05) separate halves. *SLP* Remove (from doctor-side cover): lens disc, indexing spring, magnifying lens retainer & lens.
F4	Housing (Patient-Side) Assembly	--	Separate housing from optical tube base.
F5	Lamp	--	Pull lamp from bottom of optical tube.

**** 11605 Reassembly ****

F6	Cover (Patient-Side)	--	Insert optical tube base assembly.
F7	Indexing Spring	--	Place spring into position below bumper cut-out of doctor-side cover. (Return bend on left side).
F8	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
F9	Lens Retainer	--	Place lens retainer on top of lens.
F10	Lens Disc Ass'y.	--	Clean disc. Place disc in cover. (Number side down, engaged with detent)
F11	Cover (Doctor-side)	--	Place cover onto patient-side cover/optical tube base assembly. Tighten ring, screws. Install bumper.
F12	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.

End 11605

G 11610 3.5V Halogen Coaxial Sealed Ophthalmoscope Disassembly:

G1	Bumper	--	Pull corner, peel back.
G2	Back Cover (Doctor-Side)	--	Loosen retaining ring.
G3	2 Screws	--	Remove 2 screws, (torx 05) separate halves. *SLP* Remove: lens disc, indexing spring, magnifying lens retainer & lens from doctor-side cover.
G4	Optical Tube Base Assembly	--	Remove optical tube base, filter retainer, filter assembly. *SLP*
G5	Lamp	--	Pull lamp from bottom of optical tube.

**** 11610 Reassembly ****

G6	Ophthalmoscope Body Assembly (Patient-side)	--	Inspect filter over shiny metal surface and look through filterat its own shadow. One side will show a 'blue' tint. Place tint side of the filter will be towards the inside of the scope during reassembly. (When using replacement filter, remove protective polyethylene film 2 sides). Insert filter into filter housing and place into ophthalmoscope body with filter housing finger tab towards bottom outside of scope. Insert filter retainer, & optical tube base assembly.
G7	Indexing Spring	--	Place spring into position below bumper cut-out of doctor-side cover. (Return bend on left side)
G8	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
G9	Lens Retainer	--	Place lens retainer on top of lens.
G10	Lens Disc Ass'y.	--	Clean disc. Place disc in cover. (Number side down, engaged with detent)
G11	Cover (Doctor-side)	--	Place cover onto patient-side cover/optical tube base assembly. Tighten ring, screws. Install bumper.
G12	Lamp	--	Align pin of lamp into groove of lamp socket and press in. Test.

End 11610

H	11620 3.5V Halogen Coaxial Sealed Ophthalmoscope Disassembly:		
H1	Bumper	--	Pull corner, peel back.
H2	Back Cover (Doctor-Side)	--	Loosen retaining ring.
H3	2 Screws	--	Remove 2 screws, (torx 05) separate halves. *SLP* Remove (from doctor-side cover): lens disc, indexing spring, indexing button, magnifying lens retainer & lens.
H4	Optical Tube Base Assembly	--	Remove optical tube base, filter retainer, filter assembly. *SLP*
H5	Lamp	--	Pull lamp from bottom of optical tube.
			**** 11620 Reassembly ****
H6	Ophthalmoscope Body Assembly (Patient-side)	--	Inspect filter over shiny metal surface and look through filter at its own shadow. One side will show a 'blue' tint. Place tint side of the filter will be towards the inside of the scope during reassembly. (When using replacement filter, remove protective polyethylene film 2 sides). Insert filter into filter housing and place into ophthalmoscope body with filter housing finger tab towards bottom outside of scope. Insert filter retainer, & optical tube base assembly.
H7	Indexing Spring	--	Place spring into position below bumper cut-out of doctor-side cover.
H8	Indexing Button	--	Place button into guides beneath spring. (Flat side to spring).
H9	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
H10	Lens Retainer	--	Place lens retainer on top of lens.
H11	Lens Disc Ass'y.	--	Clean disc. Place disc in cover. (Number side down, engaged with detent)
H12	Cover (Doctor-Side)	--	Place cover onto patient-side cover/optical tube base assembly , tighten ring, screws. Install bumper.
H13	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.
			End 11620

I 11630 3.5 Volt Halogen Coaxial™ Ophthalmoscope (With Multiplier) Disassembly:

I-1	Bumper	--	Pull corner, peel back.
I-2	Back Cover (Doctor-side)	--	Loosen retaining ring.
I-3	2 Screws	--	Remove 2 screws, (tprx 05) separate halves. *SLP* Remove: lens disc, cam, multiplier disc, plastic spring detent.
I-4	Optical Tube Base assembly	--	Remove optical tube base, filter retainer, filter assembly. *SLP*
I-5	Lamp	--	Pull lamp from bottom of optical tube.

**** 11630 Reassembly ****

I-6	Ophthalmoscope Body Assembly (Patient-side)	--	Inspect filter over shiny metal surface and look through filter at its own shadow. One side will show a 'blue' tint. Place tint side of the filter will be towards the inside of the scope during reassembly. (When using replacement filter, remove protective polyethylene film 2 sides). Insert filter into filter housing and place into ophthalmoscope body with filter housing finger tab towards bottom outside of scope. Insert filter retainer, & optical tube base assembly.
I-7	Multiplier Disc	--	Install multiplier disc, baffle side up, lenses at top of doctor-side cover.
I-8	Cam	--	Install cam on top of multiplier disc, slotted side up, hole of cam engaged over pivot molded into cover.
I-9	Lens Disc Ass'y.	--	Install lens disc, number side down, onto hub, with metal pin away from cam ramp.
I-10	Spring Detent	--	Place plastic spring detent into position below bumper cut-out of doctor-side cover, smooth side up, detent bumps to engage both multiplier and lens disc.

I 11630 Ophthalmoscope Reassembly Continued

I-11	Cover (Doctor-Side)	--	Place cover/disc assembly onto patient-side cover/optical tube base assembly. Tighten ring, screws. Install bumper.
I-12	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.

End 11630

J 11650 3.5 Volt Halogen Coaxial ™ Sealed Ophthalmoscope Disassembly:

J1	Bumper	--	Pull corner, peel back.
J2	Back Cover (Doctor-side)	--	Loosen retaining ring.
J3	2 Screws	--	Remove 2 screws, (torx 05) separate halves. *SLP* Remove (from doctor-side cover): lens disc, indexing spring, indexing button, magnifying lens retainer & lens.
J4	Optical Tube Base Assembly	--	Remove optical tube base, filter retainer, filter assembly.*SLP*
J5	Lamp	--	Pull lamp from bottom of optical tube.

**** 11650 Reassembly ****

J6	Ophthalmoscope Body Assembly (Patient-side)	--	Inspect filter over shiny metal surface and look through filter at its own shadow. One side will show a 'blue' tint. Place tint side of the filter will be towards the inside of the scope during reassembly. (When using replacement filter, remove protective polyethylene film 2 sides.) Insert filter into filter housing and place into ophthalmoscope body with filter housing finger tab towards bottom outside of scope. Insert filter retainer, & optical tube base assembly.
J7	Indexing Spring	--	Place spring into position below bumper cut-out of doctor-side cover.
J8	Indexing Button	--	Place button, into guides beneath spring, flat side to spring.
J9	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
J10	Lens Retainer	--	Place lens retainer on top of lens.

J11	Lens Disc Assy.	--	Clean disc. Place disc on hub. (Number side down, engaged with detent)
J12	Cover (Doctor-side)	--	Place cover onto patient-side cover/optical tube base assembly. Tighten ring, screws. Install bumper.
J13	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.

End11650

K 11660 3.5 Volt Halogen Coaxial™ Autostep Sealed Ophthalmoscope with Multiplier:

Disassembly and reassembly for the 11660 are the same as for the 11630 (as explained earlier on pages 11 and 12). Follow the same procedure but use the correct parts for the 11660.

Basic differences between the 11660 and the 11630 are as follows:

K1 The tube base assembly on the 11660 has a covered aperture assembly and the 11630 does not.

K2 The doctor side cover peep hole on the 11660 does not have a window and the 11630 does have a window.

End 11660

L 11710 3.5 Volt Halogen Sealed Ophthalmoscope:

Disassembly and reassembly of the 11710 are the same as for the 11720 as explained below. Follow the same procedure but use the correct parts for the model you are working on.

Basic differences between the 11710 and the 11720 are as follows:

L1 The 11710 does not have the slide switch/rack and pinion gear mechanism. Instead it has a small square Welch Allyn logo in the place made for the slide switch button.

L2 The 11710 does not have aperture windows on either side of the instrument.

End 11710

M 11720 3.5 Volt Coaxial Sealed Ophthalmoscope Disassembly:

M1	Bumper	--	Pull corner, peel back.
M2	Back Cover (Doctor-side)	--	Loosen retaining ring.
M3	2 Screws	--	Remove 2 screws, (torx 05) and separate halves. *SLP* Remove (from doctor-side cover): lens disc, indexing spring, indexing button, magnifying lens retainer & lens.
M4	Housing (Patient-side)	--	Separate housing from optical tube base assembly. *SLP*
M5	Switch, Gear, Ball and Spring, Rack Assembly	--	Remove individual components. *SLP*
M6	Lamp	--	Pull lamp from bottom of optical tube.

**** 11720 Reassembly ****

M7	Switch, Gear	--	Place spring in hole on right side (base towards you), place ball on top of spring. Put rack into position and place gear into engagement with rack. Center rack in housing. Put switch in slot of tool T-8118 and place switch over spring and ball in a centered position. Slide patient-side cover onto T-8118 at the switch slot and lower patient-side cover onto optical tube base assembly. Check that ball detent is properly engaged when switch is moved left and right.
M8	Indexing Spring	--	Place spring into position below bumper cut-out of doctor-side cover.
M9	Indexing Button	--	Place button, into guides beneath spring, flat side to spring.
M10	Magnifying Lens	--	Place lens into opening of body cover, round side down, flat side facing you.
M11	Lens Retainer	--	Place lens retainer on top of lens.

M 11720 Reassembly Continued

M12	Lens Disc Assy.	--	Clean disc. Place disc on hub. (Number side down, engaged with detent)
M13	Cover (Doctor-side)	--	Place cover onto patient-side cover/optical tube base assembly. Tighten ring, screws. Install bumper.
M14	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.

End 11720

N 11730 3.5 Volt Coaxial Autostep Sealed Ophthalmoscope (With Multiplier) Disassembly:

N1	Bumper	--	Pull corner, peel back.
N2	Back Cover (Doctor-Side)	--	Loosen retaining ring.
N3	2 Screws	--	Remove 2 screws, torx 05) and separate halves. *SLP* Remove: lens disc, cam, multiplier disc, plastic spring detent.
N4	Housing (Patient-side)	--	Separate housing from optical tube base assembly. *SLP*
N5	Switch, Gear, Ball and Spring, Rack Assembly	--	Remove individual components. *SLP*
N6	Lamp	--	Pull lamp from bottom of optical tube.

**** 11730 Reassembly ****

N7	Switch, Gear	--	Place spring in hole on right side (base towards you), place ball on top of spring. Put rack into position and place gear into engagement with rack. Center rack in housing. Put switch in slot of tool T-8118 and place switch over spring and ball in a centered position. Slide patient-side cover onto T-8118 at the switch slot and lower patient-side cover onto optical tube base assembly. Check that ball detent is properly engaged when switch is moved left and right.
N8	Multiplier Disc	--	Install multiplier disc, baffle side up, lenses at top of doctor-side cover.
N9	Cam	--	Place cam on top of multiplier disc, slotted side up, with the hole of cam engaged over pivot molded into cover.
N10	Lens Disc Assy.	--	Install the lens disc with the number side down, onto the hub, with the metal pin facing away from the cam ramp.

N 11730 Reassembly Continued

N11	Spring Detent	--	Place plastic spring detent into position below bumper cut-out of doctor-side cover, smooth side up, detent bumps to engage both multiplier and lens disc.
N12	Cover (Doctor-Side)	--	Place cover/disc assembly onto patient-side cover/optical tube base assembly. Tighten ring, screws. Install bumper.
N13	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.

End 11730

O 12810, 12813, 12814, 12830 2.5 Volt Pocket Scope Ophthalmoscope Disassembly:

SPECIAL NOTE: The12810, 12813, 12814, and 12830 Ophthalmoscopes are similar in repair procedures with the exception of : Aperture combinations for the 12810-12814, and base thread construction for the 12830 export model.

O1	Lamp	--	Pull lamp from bottom of optical tube.
O2	Bumper	--	Pull corner, peel back.
O3	Cover Ass'y (Doctor-side)	--	Loosen retaining ring.
O4	2 Screws	--	Remove 2 screws, (use .050" hex key) remove cover assembly (doctor-side) *SLP*. Remove (from doctor-side cover): Lens disc, indexing spring (PN128013), lever, multiplier and magnifier link. (These last two items will be installed into the doctor side cover during reassembly. During disassembly,however, they usually fall off their respective pivots and lay on top of the aperture dial assembly.)
O5	Ophthalmoscope Body Assembly	--	Remove N.D.(number dial) filter assembly. (On newer models, this part will not have the small filter on top). Remove aperture disc assembly, detent ball and indexing (coil) spring (116119), indexing spring (128024). Remove 2 screws holding lens holder assembly. Remove lens holder assembly and filter assembly.
			**** Reassembly ****
O6	Ophthalmoscope Body Assembly	--	Insert optical tube base assembly into ophthalmoscope body. Inspect filter over shiny metal surface and look through filter at its own shadow. One side will show a'blue' tint. Place tint side of the filter towards the inside of the scope during reassembly. (When using new replacement filter, remove protective polyethylene films 2 sides) insert filter into filter housing and place into ophthalmoscope body with filter housing finger tab towards top of the scope. Place lens holder assembly into position and fasten with 2 screws. Place indexing spring (128024) onto raised anchor. Round end of indexing spring should face hub. Aperture disc assembly onto hub, hole in disc at top, apertures at bottom. Insert indexing spring (coil spring PN 116119) into hole and place ball bearing on top of it. Place N.D. filter assembly on top of the center of the aperture disc assembly with filter assembly pivot in hole at base.

O7	Cover Assembly (Doctor-Side)	--	Place lever into position in the (-) negative with magnifier lens position, (-) side. Place indexing spring (128013) over lever and onto the raised anchor. (Rounded end of indexing spring should face the lens disc assembly hub as shown in repair parts diagram).
O8	Lens Disc Assy.	--	Clean disc. Place disc on hub. (Number side down, engaged with detent)
O9	Multiplier	--	Place multiplier on top of lens disc, engaged with hub, pivot facing up, and lenses at the top of the assembly (as shown in the repair parts diagram). Connect multiplier to lever with magnifier link, thick end of link towards the magnifier, and with the curved side towards the hub as shown in the parts diagram.
O10	Cover Ass'y (Doctor-Side)	--	Place cover onto ophthalmoscope body assembly. Place ring onto base with numbers "128" right-side-up. Tighten ring, screws. Install bumper.
O11	Lamp	--	Align pin of lamp into groove of lamp socket and press lamp in. Test.

End 12810, 12813, 12814, 12830

APPENDIX 1

TOOLS/MATERIALS/SUPPLIES

OPHTHALMOSCOPE: 11110, 11400, 11411, 11470, 11475, 11500, 11511, 11600, 11605, 11610, 11620, 11630, 11650, 11660, 11710, 11720, 11730, 12810, 12813, 12814, 12830.

Bayonet Pliers (For removing lamps)	Welch Allyn T-10802
Strap Wrench	Welch Allyn T-10913
Ring-Nut Wrench ('TEE'Handle)	Welch Allyn T-11896
Switch Tool	Welch Allyn T-8118

T5 Torx Flag Style WHA #30-13 Torx ™ Bit # 440-TX-05 or Torx Screwdriver (Torx .05) Replaceable-Bit 1/4" Driver (APEX M-1505-P)For use with Torx .05 bit
Tweezers (Grobet Peer #7 Stainless Steel)
12" X 12" (approximately) Foam Pad (Mouse Mar American Covers Inc.)
Windex ™ Glass Cleaner or Vestal Glass Cleaner #8618-21
Lint Free Wipes / Swabs
Jewelers Screwdriver With 1/16" Flat Blade
Small Ultasonic Bath ie:* Pro-Craft Model 23.577-1
Ultra Sonic Bath Cleaning Solution
Miller Stephenson Aero-Duster #MS-222
De-Ionized Water.
Small Stainless Steel Tubs (1 QT. Capacity or less)

One each of the following items: Taps are used to clean up threads or open the hole up to the next size where permissible.

TAP/DRILL/KEY:	TAP	DRILL	KEY
	2-56	#50 (.0700")	.035"
	3-48	#47 (.0785")	.050"
	4-40	#43 (.0890")	.050"

APPENDIX 2

Inspections for Repaired Ophthalmoscopes:

1. Operate all slide switches.

2. Rotate knobs and discs to determine whether or not detents are operating correctly and operating smoothly, positively, and through full stroke.

3. View through the scope to determine that the aperture, filter, or lens are correctly aligned through each detent position.

4. Inspect the cleanliness and condition of the lens dial. No scratches, dirt, glue, or any material should be visible.

5. Check the illuminated and non-illuminated numbers on the lens dial. They should be in the center of the aperture.

6. Check projected images for shadows, dirt, and filament images using the aperture dial and the slide switch if so equipped.

7. Check windows for cracks, streaks, spots or anything that would obscure the viewed image.

8. Check for any stray light that interferes with looking through the scope. Project a fixation spot into a darkened box. Look through the peephole with a lens setting of '0'. There should be no bright streaks in the image, or any light appearing in the dark area surrounding the projected spot.

9. Check the scope for scratches or physical damage before the repair as well as after.

10. Clean the repaired scope and wrap it in a plastic bag to protect it from dust and fingerprint contamination.

APPENDIX 3
Checklist for:

Final Inspection of Ophthalmoscopes

Ophthalmoscope Checklist:	*Ref#:*	*Model:*
1. [] Bumper in place	A02387 (V1)*	all
2. [] Retaining ring up (body&cover)		all
3. [] Lens disc turns freely	A02121	all
4. [] Leave lens disc assy on '0'		all
5. [] Lever does not jump		12810
6. [] Lamp makes contact w/ handle		all
7. [] Numbers readable on lens disc	A02121	all
8. [] No cracks in cello when illuminated		116 & 115
9. [] No glare with filters	A02387 (V8)**	all w/filter
10.[] Filter window is secure	A02787 (V8)	11720 & 30
11.[] Retainer secure in mirror assembly	all	
12.[] Filter assy. not catching on mirror		all w/mirror
13.[] Lens clarity	A02121	all
14.[] Aperture turns freely		all
15.[] Aperture on large circle		all
16.[] Filter window open		all

* V1=visual measurement (repair operator judgement)

** V8=remove from fixture or handle and apply General Electric RTV #108 to adjustment hole. (clear translucent silicone sealant, WA M#30313).

APPENDIX 4

Troubleshooting Ophthalmoscopes

Model #'s: 11400,11411, 11610, 11620,11630, 11650,11660

Problem	Cause	Corrective Action
Dirty Optics	Normal use	Clean optics but do not use alcohol on 116 series.
Obstruction in viewing area	Heavy dirt or scratch on lens disc.	Replace lens disc.
	Filter Assembly: a) discolored b) scratched c) fingerprinted	Replace filter assembly. Replace filter assembly. Clean
	Mirror hood bent up	Replace mirror.
Apart	Insert pulled out from overtightning of screws.	Replace body set.
	User disassembled.	Replace missing or damaged parts and reassemble.
Glare 'Reflection of extra light seen through Oph. with filter down." VOTE: Plastic lenses [objective lens and filter) scratch easily. To clean, use a soft lens paper and or cotton swab.	Dirt or scratches on: a) mirror b) filter c) objective lens	Clean parts if dirty. Replace if scratched.
Shadows on light spot	Dirty Optics	Clean
	Lamp filament asymmetrical.	Turn lamp around to opposite slot in sleeve or replace if this does not remove shadows.
	Lamp envelope dirty.	Clean with soft cloth.
	Loose condensing lens or retaining ring. Condensed lens tipped.	Check lens (tap with small needle and check for movement if loose). Press down to tighten. Lens should be flat. tilted it will project light "off center".
	Scratch or chip	Replace condensing lens on condensing lens.
	Objective lens loose	Remove retaining ring from mirror mount and reset. (Refer to mirror assembly procedure).
	Wrong lamp	Replace with correct lamp.

APPENDIX 4 continued....
Troubleshooting Ophthalmoscopes

MODEL #: 11400,11411,11610 11620,11630,11650,11660

Problem	Cause	Corrective Action
Numbers not readable on ens assembly.	Alcohol damage (improper cleaning)	Replace magnifier lens disc (clean with Vestal cleaner or window cleaner)
No light	Lamp problem a) pin off-jammed in sleeve, not pinned correctly b) blown - envelope will appear white or gray c) shadow - bent filament d) wrong lamp/ not Welch Allyn lamp	Replace lamp Replace lamp Turn lamp in sleeve or replace lamp. Replace with correct Welch Allyn lamp.
Broken mirror	Dropped Customer tampered with Ophth. Mirror or hood unglued	Replace mirror
Will not focus	Alcohol damage (alcohol will discolor mirror and lenses) Objective lens loose. Lens carrier out of position	Replace mirror, lenses Remove from mirror and reset. Adjust lens carrier (Refer to adjustable mirror assembly instructions)
Intermittent light output	Loose connection with power source Loose condensing or objective lens Wrong lamp	Check base/handle. (See problem below) Inspect and secure Replace with correct Welch Allyn lamp
Poor connection with power source.	Optical tube base: a) worn (loose fit) b) bent (tight fit) c) misaligned optic sleeve or lamp	Replace base (a) & (b) Remove and realign
Lens assembly sticks or drags (friction)	Aperture dial: a) rubs on body b) ball bearing rotation stiff Lens disc assembly: a) warped b) 11630 lens: 1) film warped or pin not engaging in cam properly. 2) multiplier disc baffle warped 3) not cleaned properlly.	 Shave cut out area in cover (body) slightly. Ream bearing hole in base. Apply small dot of molykote 33 grease. Replace lens disc. b-l, b-2, b-3 .... Replace lens disc, multiplier, or cam. (Visually check for warp. It is not easily detected).

NOTE: When changing new style cover from the old style (index spring to new spring and button), be sure to exchange old style filter retainer (different design). Failure to do so will result in stiff rotation of lens assembly.

APPENDIX 4 continued. . . .
Troubleshooting Ophthalmoscopes

MODEL #: 12810 (PocketScope)

Problem	Cause	Corrective Action
Mirror unglued, broken , scratched	Mirror adheres to RTV during disassembly. Cracked (Ophth dropped) Cleaned improperly.	Remove mirror from lens older and replace with new body/mirror assembly.
Glare	Film on mirror filter or lenses caused by improper cleaning. Dirty optics.	Replace body with mirror assemlby or filter. Clean with window cleaner.
Lever sticks. Lever moves by itself when ens assembly is rotated.	Cover Assy warped. Multiplier catches edge of lens disc.	Replace cover. Replace disc or multiplier.
Poor focus	Dirty optics Objective lens	Clean lenses (no alcohol) Place open aperture hole over lens area, adjust focus, re-seal with G.E. 108 RTV M30313 (surround peg on objective with RTV. Make flush so that turning aperture does not interfere).
Intermittent or no light	Bulb blown. Retainer not on tight. Loose sleeve. Minor unglued from body. Poor connection with power source.	Replace bulb. Tighten retainer with strap wrench. Tighten screw on back of optical base (be sure sleeves is aligned). Replace body-withmirror assembly. Check with known good handle.
Loose filter window or polarized) filter catching. NOTE: For “shadow in ‘light circle", be sure filter is completely open or closed. Check that lamp is in sleeve lightly.	Rubber tube worn.	Replace rubber tube.
film on numeral lluminator	Glue failure	Replace with new illuminator. (New style has no film).

Section 2

STRABISMOSCOPE

MODEL #	PAGE
12400	1-6

STRABISMOSCOPE

12401 3.5V Strabismoscope (OCCLUDER) Disassembly:

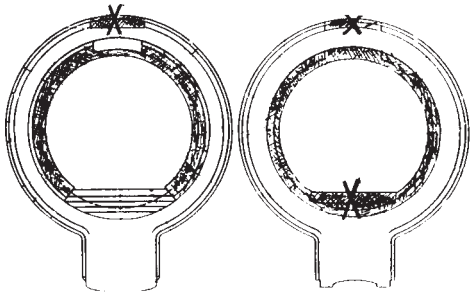
1. Lamp — Pull lamp from base. (Use tweezers)
2. Beam Splitter — Loosen retaining ring all the way towards base. (Use T-1413 rubber jaw ring pliers or T-10913 strap wrench to loosen retaining ring.)
   CAUTION: ON : Beam splitter may fall out. Carefully separate body halves by pivoting halves apart at top of instrument. Unhook halves at top. Use a fine point blade to separate RTV bond between beam splitter and physician side cover.
3. Base — Remove base from cover.
4. Lamp Collar — Remove lamp collar from base.

**12400 Reassembly **

5. Beam Splitter — Clean beam splitter seating surfaces shown in FIG.1 by shading and X's

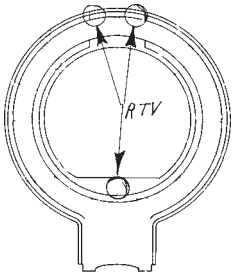
PATIENT SIDE DOCTOR SIDE

FIG. 1



Posistion Doctor Side Cover (black) on flat surface and apply one .06" drop of clear RTV sealer to center of each of three circled locations in FIG. 2.

FIG. 2

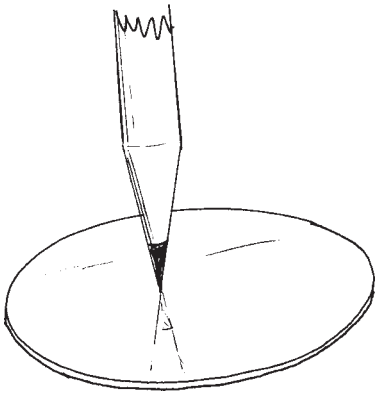


12401 Reassembly Continued.....

5. Beam Splitter Reassembly cont'd

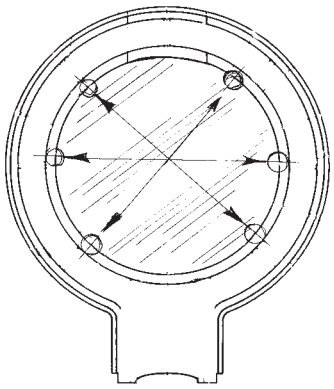
Determine which side of beam splitter is coated by placing a pencil point onto the surface as in FIG. 3. Pencil point and reflected image meet on coated side / patient side. Image does not touch pencil point on uncoated side (doctor side).

FIG. 3



Clean beam splitter with lens cleaner and place it into RTV treated doctor side (black) cover.
P a t i e n t s i d e u p.
Apply .18" drop of clear RTV sealer to each of six places shown circled in FIG. 4. Drop should contact both beam splitter and the cover.

FIG. 4



Insert the light carrier base into the doctor side cover as shown in FIG. 5.

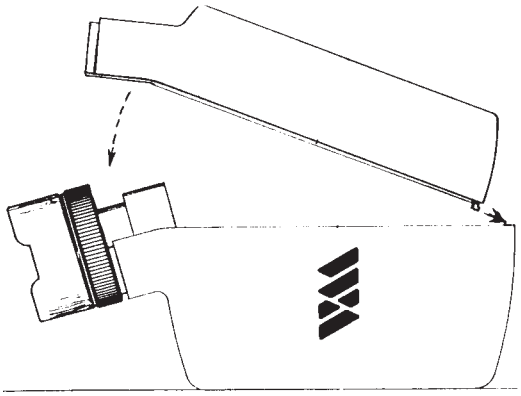
12401 Reassembly Continued.....

5. Beam Splitter
Reassembly Continued

FIG. 5

Assemble both cover halves together by first engaging the latch at the top of the instrument. See FIG. 6. Then close the covers together at the bottom. Screw the lock ring up to the covers and tighten. (Smooth ridge towards bottom of base.)

FIG. 6



6. Lamp Collar — Insert replacement lamp collar into base. (Use tweezers). Push in and turn to seat lamp collar.

7. Lamp — Clean lamp with alcohol and cotton ball. Align the rib in the lamp base with either of the two slots in the lamp collar. Gently press the lamp into the collar. Clean both sides of the beam splitter. Connect to battery handle and test.

End 12401 Reassembly

STRABISMOSCOPE

TOOLS/MATERIALS/SUPPLIES

Bayonet Pliers	Welch Allyn T-10802

Only one of the next two T-tools is required:

Rubber Jaw Ring Pliers	Welch Allyn T-1413
Strap Wrench	Welch Allyn T-10913

Tweezers	(Stainless Steel or Plastic, must be Non-Magnetic, Grobet Peer # 7)
12"X 12" (Approximately)	Foam Pad Mouse Mat ™, American Covers Inc.

Windex™ Glass Cleaner or Vestal Glass Cleaner #8618-21

Lint Free Wipes / Swabs

Aero-Duster #MS-222

De-Ionized Water.

Small Stainless Steel Tubs (1 Qt. Capacity Or Less)

Silicone RTV Sealant M-30380	(Dow Medical Adhesive Silicone) or (G.E. Translucent RTV 108)

Inspections For Repaired Strabismoscopes:

1. Check locking ring for tightness.

2. Check to see that instrument fits on handle before repairing. Base rim may be bent if dropped on hard surface.

3. Check beam splitter for cracks, chips or other defects. Check for any stray light that interferes with the viewed image.

4. Check the scope for scratches, physical damage, rough surface before repairing.

5. Clean the repaired scope and wrap it in plastic to protect it from dust and fingerprint contamination.

6. Check for function.

STRABISMOSCOPE TROUBLESHOOTING
MODEL #: 12401

Problem	Cause	Corrective Action
Broken beam splitter (Mirror)	Dropped	Replace beam splitter.
Apart	Loose retaining ring	Tighten ring.
	Beam splitter unglued	Reglue (RTV)
Scratched beam splitter	Dropped	Replace
	Not cleaned properly	Clean (Refer to cleaning instructions).
Lamp loose	Lamp collar worn or missing.	Replace collar.

Section 3

RETINOSCOPES

MODEL #	SUB-SECTION	PAGE
18201	A	1-2
17201	B	2
18100	C	3-4
17710	D	4-5
17610	F	6
18000	F	6
18010	E	6
17600	G	7-8
17700	H	8-9

RETINOSCOPES

Retinoscope Disassembly:

A. 18201 3.5 Volt Retinoscope Disassembly:

A1.	Lamp	—	Pull lamp from bottom. (Use tweezers).
A2.	Bumper	—	Pull corner, peel back. (Use fingers).
A3.	Magnetic Overlay	—	Lift corner, peel off. (Use thin blade).
A4.	Sleeve Grip	—	Pull bottom edge off by inserting tweezers under bottom edge of grip and removing grip from circumference. Pull whole grip off. (Use tweezers carefully).
A5.	Nameplate	—	Lift corner, peel off. (Use thin blade).
A6.	Doctor-side Cover	—	Remove 3 screws (.05 Torx) and separate covers. Remove doctor-side window retainer and window.
A7.	Patient-side	—	Remove : Optics carrier subassembly, main sleeve assembly, lens positional control device (small square). NOTE: New spring style introduced early 1999. Coil spring 182047 and cap 182048 can be removed from patient-side cover 182020-4.

**** 18201 Reassembly ****

A8.	Patient-side	—	Replace small spring and spring cap into patient-side cover Install small square lens positional control device and main sleeve assembly. Insert spring and ball under slide switch tab of optics carrier subassembly. Hold in place with T-8118. Place optics carrier subassembly into cover.

18201 Retinoscope Reassembly Continued

A9.	Doctor-side Cover	__	Install doctor-side window and window retainer. Join doctor side and patient side assemblies. Install 3 screws. Polarizing slide switch should operate with click detents at both ends of stroke.
A10.	Sleeve grip	—	Push on and smooth out between top and bottom of edge of adjustment barrel. (Use fingers).
A11.	Magnetic Overlay	—	Position over center of overlay recess and press into place.
A12.	Bumper	—	Press into slot. (Use fingers).
A13.	Lamp	—	Align pin on lamp base with groove of lamp socket and press into position. Clean lamp with alcohol and swab then turn on. (Use tweezers to position lamp, then press with fingers).

End 18201

B. 17201 2.5 Volt Retinoscope:

NOTE: The 17201 2.5 volt retinoscope is slightly different from its 'look-alike', the 18201 3.5 volt retinoscope. Disassembly and reassembly are similar. Differences are listed below:

* Lamp and power source voltage.
* No polarizer in the 17201.
* No windows (either side) in the 17201.
* Mounting configuration (bases are not iterchangeable).

C. 18100 3.5. Volt Halogen Streak Retinoscope Disassembly:

C1.	Lamp Carrier	—	Pull lamp carrier from bottom. (Use needle-nose pliers). Inspect small spring near flange.
C2.	Lamp	—	Unscrew lamp from lamp carrier.
C3.	Bumper	—	Pull corner, peel back. (Use fingers).
C4.	Eyepiece Assembly	—	Unscrew eyepiece assembly. (Use fingernails to grip).
C5.	Head Assembly	—	Unscrew sleeve assembly from head. (Use strap wrench T-10913 to hold head collar).
C6.	Control Sleeve Subassembly	—	Remove stop washer from top of control sleeve sub-assembly. Pull control sleeve sub-assembly from outer sleeve assembly.

**** 18100 Reassembly ****

C7.	Control Sleeve Subassembly	—	Insert control sleeve sub-assembly into outer sleeve assembly knurled end first. (Squeeze plastic split ring with fingers to move it beyond:top Of outer sleeve and cutout of outer sleeve. Use fingers). Install stop washer onto top of control sleeve subassembly.
C8.	Head assembly	—	Screw sleeve assembly into collar of head assembly. (Use strap wrench to tighten). Align as per parts diagram.
C9.	Eyepiece Assembly	—	Screw eyepiece assembly into head assembly. (Use fingernails to tighten).
C10.	Bumper	—	Press into slot. (Use fingers).
C11.	Lamp	—	Screw lamp into light carrier assembly. (Use fingers to tighten lamp). Clean lamp with alcohol and soft wipe.

C12.	Lamp Carrier	—	Position lamp carrier into control sleeve with very light pressure and slight rotation to align two tabs near lamp with grooves in the interior of the control sleeve. Do not force. When lamp carrier is lined up with grooves, insert lamp carrier into control sleeve. Test.

End 18100 Reassembly

D. 17710 2.5 Volt Halogen Streak Retinoscope Disassembly:

D1.	Lamp carrier	—	Unscrew base assembly (collar) from outer sleeve.(Use strap wrench T-10913). Remove lamp carrier. Inspect small spring near flange.
D2.	Lamp	—	Unscrew lamp from lamp carrier.
D3.	Bumper	—	Pull corner, peel back. (Use fingers).
D4.	Eyepiece Assembly	—	Unscrew eyepiece assembly. (Use fingernails to grip).
D5.	Head Assembly	—	Unscrew sleeve assembly from head. (Use strap wrench to hold head collar).
D6.	Control Sleeve Subassembly	—	Remove stop washer from top of control sleeve subassembly. Pull control sleeve subassembly from outer sleeve assembly.

**** 17710 Reassembly ****

D7.	Control Sleeve Subassembly	—	Insert control sleeve subassembly into outer sleeve assembly knurled end first. (Squeeze plastic split ring with fingers to get it beyond: top of outer sleeve and cutout of outer sleeve). Install stop washer onto top of control sleeve subassembly.

D8.	Head Assembly	—	Screw sleeve assembly into collar of head assembly. (Use strap wrench to tighten). Align as per parts diagram.
D9.	Eyepiece Assembly	—	Screw eyepiece assembly into head assembly. (Use fingernails to tighten).
D10.	Bumper	—	Press into slot. (Use fingers).
D11.	Lamp	—	Screw lamp into light carrier assembly. (Use fingers to tighten lamp). Clean lamp with alcohol and soft wipe.
D12.	Lamp Carrier	—	Position lamp carrier into control sleeve with very light pressure and slight rotation to align two tabs near lamp with grooves in the interior of the control sleeve. Do not force. When lamp carrier is lined up with grooves, insert lamp carrier into control sleeve. Secure light carrier assembly by screwing on base assembly. (Tighten with strap wrench). Test.

End 17710 Reassembly

E. 18010 3.5. Volt Halogen Spot Retinoscope Disassembly:

E1.	Lamp	—	Pull 3.5 v. Lamp from base. (Use needle nose pliers).
E2.	Bumper	—	Pull corner, peel back. (Use fingers).
E3.	Eyepiece Assembly	—	Unscrew eyepiece assembly. (Use fingernails to grip).
E4.	Head Assembly	—	Unscrew optical base subassembly from head. (Use strap wrench T-10913 to hold head collar).

**** 18010 Reassembly ****

E5.	Head Assembly	—	Screw optical base subassembly into collar of head assembly. (Use strap wrench to tighten).
E6.	Eyepiece Assembly	—	Screw eyepiece assembly into head assembly. (Use fingernails to tighten).
E7.	Bumper	—	Press into slot. (Use fingers).
E8.	Lamp	—	Clean lamp with alcohol and soft wipe. Press lamp into base.

End 18010 Reassembly

F. 17610 2.5 Volt and 18000 3.5 Volt Spot Retinoscopes:

Note: The 17610 and 18000 spot retinoscopes differ slightly from the 18010 as listed below. Disassembly and reassembly are similar however.

* Lamp voltage
* Base configuration
* Length of optical base assembly

G. 17600 Spot Retinoscope Disassembly:

G1.	Lamp Carrier	—	Unscrew light carrier from body subassembly.
G2.	Lamp	—	Remove diaphragm assembly. Unscrew lamp from light carrier.
G3.	Bumper	—	Unscrew 3 screws and remove cover.
G4.	Eyepiece	—	Unscrew eyepiece assembly (use fingernails to grip).
G5.	Mirror Assembly	—	Unscrew 1 screw. Remove assembly from body subassembly.
G6.	Lens Mount Assembly	—	Remove lens mount assembly.
G7.	Contact and Bayonet Assy	—	Unscrew and remove contact and bayonet assembly from base. Use bayonet pliers T-10802.

**** 17600 Reassembly ****

G8.	Contact and Bayonet Assy	—	Replace contact and bayonet assembly into base. Install and tighten with bayonet pliers T-10802.
G9.	Lens mount Assembly	—	Insert lens mount assembly into body subassembly. Align hole in assembly with hole in body subassembly.
G10.	Mirror Assembly	—	Install assembly into body subassembly and secure with screw.
G11.	Bumper	—	Position bumper over top of cover and attach cover to body subassembly with 3 screws. (Insert the 2 short screws at the top). The long screw must engage hole in lens mount assembly.
G12.	Eyepiece	—	Screw eyepiece assembly into cover. (Use fingernails to tighten).
G13.	Lamp	—	Screw lamp into light carrier assembly. (Use fingers to tighten lamp).
			Clean lamp with alcohol and soft wipe.

17600 Reassembly Continued

G14.	Lamp Carrier	—	Screw light carrier to body subassembly. Test.

End 17600 Reassembly

H. 17700 Streak Retinoscope Disassembly:

H1.	Lamp Control Assembly	—	Unscrew lamp control assembly from body subassembly.
H2.	Lamp	—	Unscrew lamp from lamp control subassembly.
H3.	Bumper	—	Unscrew 3 screws and remove cover. Remove bumper from cover.
H4.	Eyepiece	—	Unscrew eyepiece assembly from cover. (Use fingernails to grip).
H5.	Mirror Assembly	—	Unscrew 1 screw. Remove assembly from body subassembly.
H6.	Lens Mount Assembly	—	Remove lens mount assembly.
H7.	Contact and Bayonet Assy	—	Unscrew and remove contact and bayonet assembly from base. Use bayonet pliers T-10802

**** 17700 Reassembly ****

H8.	Contact and Bayonet Assy	—	Replace contact and bayonet assembly into base. Use bayonet pliers T-10802
H9.	Lens Mount	—	Insert lens mount assembly into body subassembly. Align hole in assembly with hole in body sub-assembly.
H10.	Mirror Assembly	—	Install assembly into body sub-assembly and secure with screw.

H11.	Bumper	—	Position bumper over top of cover and attach cover to body sub-assembly with 3 screws (2 short screws at top). Long screw must engage hole in lens mount assembly.
H12.	Eyepiece Assembly	—	Screw eyepiece assembly into cover. (Use fingernails to tighten).
H13.	Lamp	—	Screw lamp into light carrier assembly. (Use fingers to tighten lamp). Clean lamp with alcohol and soft wipe.
H14.	Lamp Carrier	—	Screw light carrier to body sub-assembly. Test.

End 17700 Reassembly

APPENDIX
RETINOSCOPES TOOLS/MATERIALS/SUPPLIES

Needle Nose Pliers	
.028 Hex Key	
Torx .05 Screwdriver	
Strap Wrench	Welch Allyn T-10913
Slide Switch Holding Tool	Welch Allyn T-8118-30

Tweezers (Grobet Peer #7 Stainless Steel)
12"X 12" (Approximately) Foam Pad
Windex™ Glass Cleaner or Vestal Glass Cleaner #8618-21
Lint Free Wipes / Swabs
Jewelers Screwdriver with 1/16" Flat Blade
Small Ultrasonic Bath
Ultra Sonic Bath Cleaning Solution Ie: Micro™ Liquid Laboratory Cleaner.
Miller Stephenson Aero-Duster #MS-222
De-Ionized Water.
Small Stainless Steel Tubs (1 Qt. Capacity Or Less)

Inspections For Repaired Retinoscopes

1. Check streak focus and out of focus uniformity.
2. Check polarizer switch for positive detent and smooth operation.
3. Check control sleeve for both rotational and vertical smooth operation.
4. Check optics for cleanliness and clarity.
5. Clean and seal retinoscope in plastic bag to protect from dust and fingerprint contamination.

TROUBLESHOOTING RETINOSCOPES

Instrument: Retinoscopes (Streak)
Model #: 1 8 1 0 0

Problem	Cause	Corrective Action
Control sleeve operation difficult	Light carrier inserted incorrectly.	Remove and align groove in control sleeve with 2 slots on band at top of light carrier.
	Tension spring worn on control sleeve.	Replace control sleeve.
	Outer sleeve bent.	Replace outer sleeve.
	Chemical build up (residue) inside of sleeve from improper cleaning.	Use window cleaner.
Does not fit in handle properly	Tight or no fit (dropped) bent.	Replace outer sleeve at base of outer sleeve.
	Loose. Worn.	Replace outer sleeve.
Poor focus	Lamp filament not aligned properly.	Replace lamp
	Dirty optics.	Clean mirror, eyepiece and control sleeve lens with glass cleaner. Clean lamp. Remove eyepiece to clean back side of mirror and eyepiece lens.
Intermittent light	Contact between light carrier and inner ledge of outer sleeve.	Remove light carrier and apply small amount of conductive grease to ledge. Put in light carrier and rotate in down position repeatedly to test.
	Worn or loose wire.	Replace light carrier contact on light carrier.
	Lamp not inserted properly.	lighten down lamp so that it makes proper contact
Broken mirror	Dropped	Replace head assembly.
Loose head assembly	Worn or loose retaining ring on collar.	If loose, push ring down with screwdriver. loose, replace retaining ring.
	Washer missing.	Install washer.

Note: Damage to the head assembly, other than eyepiece, requires replacement of the head since it does not disassemble.

Note: The head assembly of the 17610 (2.5 v), 17710 (2.5 v), and the 18010 (3.5 v) spot retinoscopes are the same as the 18100 streak retinoscope. However, they have a different sleeve assembly. The problems are the same as the 18100 streak retinoscope with the following exceptions: 17710, the light carrier looks much like the 18 100 light carrier. They are not interchangeable as they have a different lamp (see parts catalog) and control sleeve operation would be affected.

TROUBLESHOOTING RETINOSCOPES

Instrument: Retinoscopes
Model #: *18200 streak and 18300 spot*

Problem	Cause	Corrective Action
Film on window (difficult to see image)	Fingerprints scratches Incomplete cleaning	Clean lenses with alcohol and soft cloth. Use cotton covered toothpick to clean small peephole.
Not focusing properly	Lamp filament not aligned.	Replace lamp.
Control sleeve too loose Control sleeve too tight	Lens positional control device. Lens positional control device out of position.	Replace PN 182025, (black rubber part). Reposition or replace with new part.
Magnetic overlay missing	Self adhesive is not sticking.	Replace with new magnetic overlay.
No light	Lamp problem a) lamp blown b) lamp not seated	 Replace lamp Align pin on lamp with groove in socket.
Windows scratched or loose	Cleaned improperly Window unglued	Replace cover assembly. Replace cover assembly.
Scope rattles	Lens has fallen out of scope. Uses old style retaining ring.	Replace control sleeve.

NOTE: Do not take cover assembly apart more than twice. Repeated insertion and removal of self tapping screws in plastic screw holes in patient side cover reduces the gripping power of plastic holes.

Section 4

OTOSCOPES

MODEL #	SUB-SECTION	PAGE
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OTOSCOPES

SPECIAL INSTRUCTIONS:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog PN 900299. Clean all returned scopes by wiping with a solution of 10% Clorox / 90% Water. Use special tools, lens cleaner, and lens tissue as listed in Appendix. Do not apply alcohol, chemicals or water to the mirror or lenses. Follow disassembly and assembly sequences as printed. Begin with a thorough inspection to understand the customer complaint and its cause. Perform tests as specified in the Appendix.

A. 20000 (20002 without Speculum) 3.5V Otoscope Disassembly:
23520 (stamped 20000A) Screw-on 3.5V Otoscope Disassembly:
23520 (stamped 20000R) Snap-on 3.5V Otoscope Disassembly:

A1.	Lens Holder Assembly	—	Slide lens holder assembly out of otoscope body assembly. Inspect lens and seal.
A2.	Base Assembly	—	20000R, pull the base assembly from the 20000 otoscope body. 23520, unscrew (counter-clockwise) the base assembly from the 23520 otoscope body.
A3.	Lamp	—	Pull lamp straight out of bottom of base assembly.
A4.	Lamp Collar	—	Remove lamp collar from bottom end base assembly. (Use tweezers).

**** 20000 / 23520 Reassembly ****

A5.	Lamp Collar	—	Insert replacement lamp collar into base assembly through bottom. (Points of collar should face up).
A6.	Lamp	—	Clean replacement lamp and carefully insert into bottom of base assembly.
A7.	Base Assembly	—	20000R, press the base assembly onto the 20000 otoscope body. 23520, screw (clockwise) the base assembly onto the 23520 otoscope body.
A8.	Lens Holder Assembly	—	Clean lens and slide lens holder assembly into otoscope body assembly. Inspect. Perform Otoscope Pneumatic Test A00181.

End 20000R / 23520

B. 24020 (24033 without Speculum) 2.5V Ototscope Disassembly:
24033 (24031 without Speculum) 2.5V Otoscope Disassembly:
25020 (25022 without Speculum) 3.5V Otoscope Disassembly:
23510 (stamped-25020A) 3.5V Otoscope Disassembly
23570 (stamped-240A) International 2.5V Otoscope Disassembly

B1.	Lens Holder Assembly	—	Slide lens holder assembly out of otoscope body assembly. Inspect lens and seal.
B2.	Lamp	—	Pull lamp straight out of bottom of base.

**** 24020 / 24033 / 25020 / 23510 / 23570 Reassembly ****

B3.	Lamp	—	Select appropriate replacement lamp. Clean lamp and carefully insert into bottom of base.
B4.	Lens Holder Assembly	—	Clean lens and slide lens holder assembly into otoscope body assembly. Inspect. Perform Otoscope Pneumatic Test A00181.

End 24020 / 24033 / 25020 / 23510 / 23570

C. 21110 2.5v Otoscope Disassembly:

C1.	Otoscope Body	—	Unscrew otoscope body from battery handle. Check tightness of threaded ring.
C2.	Otoscope Illuminator Assembly	—	Unscrew illuminator assembly from battery handle.
C3.	Lamp	—	Pull lamp straight out of bottom of otoscope illuminator assembly.
C4.	Lamp Collar	—	Remove lamp collar from bottom end of otoscope illuminator assembly. (Use tweezers).
C5.	Lens	—	Slide lens out of otoscope body. Inspect lens and seal.

**** 21110 Reassembly ****

C6.	Lens	—	Clean lens and slide lens into otoscope body assembly.
C7.	Lamp Collar	—	Insert replacement lamp collar into otoscope illuminator assembly through bottom. (Points of collar should face up.)
C8.	Lamp	—	Clean lamp and carefully insert into bottom of otoscope illuminator assembly.

C. 21110 Otoscope Disassembly Continued

C9.	Otoscope Illuminator Assembly	—	Screw illuminator assembly onto battery handle.
C10.	Otoscope Body	—	Screw otoscope body onto battery handle. Inspect.

End 21110

D. 21130 2.5. Otoscope Disassembly:

D1.	Otoscope Body	—	Unscrew otoscope body from battery handle. Check tightness of threaded ring.
D2.	Lamp	—	Pull lamp straight out of bottom of otoscope body assembly.
D3.	Lamp Collar	—	Remove lamp collar from bottom end of otoscope body assembly. (Use fine tweezers).
D4.	Lens	—	Slide lens out of otoscope body. Inspect lens and seal.

**** 21130 Reassembly ****

D5.	Lens	—	Clean lens and slide lens into otoscope body assembly.
D6.	Lamp Collar	—	Insert replacement lamp collar into otoscope body assembly. (Points of collar should face up).
D7.	Lamp	—	Clean lamp and carefully insert into bottom of otoscope body assembly.
D8.	Otoscope Body	—	Screw otoscope body onto battery handle. Inspect.

End 21130

E. 20100 (20101without Speculum) 2.5V Otoscope Disassembly:
20150 2.5V Ootoscope Disassembly:
(Above otoscopes are WIRED and not fiber-optic.)

E1.	Lamp	—	Pull lamp hood off. Unscrew lamp.
E2.	Window Assembly	—	Unscrew spring cup screw. Remove spring cup, spring, and wear plate. Remove window assembly.
E3.	Lens	—	Unscrew lens retainer. (Use lens window wrench tool #T-847) remove lens. Remove and discard gasket.
E4.	Contact Assembly	__	Remove bayonet contact. Unscrew bayonet assembly and pull off of wire. (Wire is sealed into the bayonet assembly with RTV silicone sealant. Therefore do not remove bayonet contact and assembly unless you are planning to replace the contact assembly). Unscrew flat screw. Push out old contact assembly and pull out wire. Clean out RTV from both the bayonet and the otoscope light guide wire channel.

**** 20100, 20150 Reassembly ****

E5.	Contact Assembly	__	See FIG. 1 through 3. Position replacement contact assembly on doctor-side of otoscope light guide. With wire down, insert contact assembly into hole as shown in FIG. 1 below. Push contact assembly into hole slightly beyond wire channel as shown in FIG. 2. Insert the end of the wire into the wire channel and push through the wire channel so that it comes out of the bottom of the scope as shown in FIG. 3. Reposition the contact assembly slightly rearward so that the wire goes directly down into the wire channel hole. Screw flat screw flush with light guide.

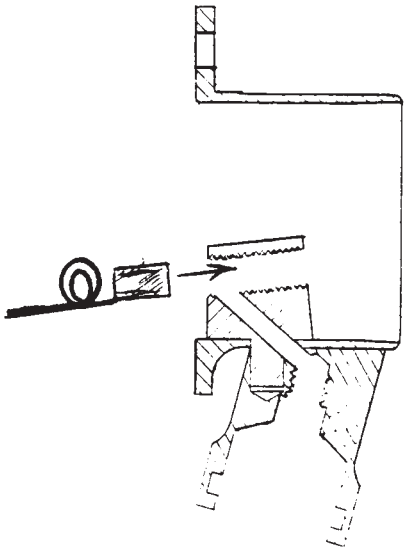


FIG. 1

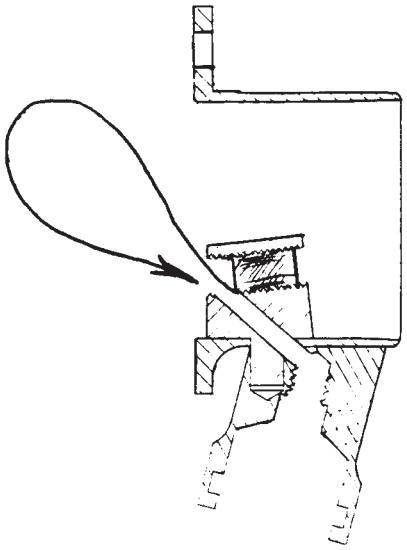


FIG. 2

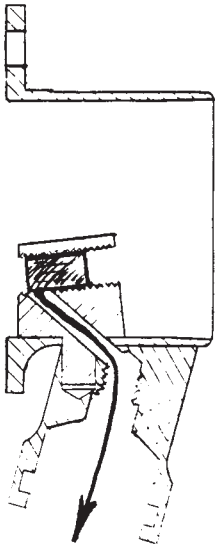


FIG. 3

E6. Bayonet Assembly — Insert wire through the bayonet assy. Fill with medical grade RTV sealant. Screw bayonet assy into scope while carefully applying slight tension on the wire to remove excess wire from the scope.

E7. Bayonet Contact — Remove insulation from the wire that protrudes from the end of the bayonet assembly. Press bayonet contact into the small hole in the end-insulation of the bayonet assembly so that it has good electrical contact with the wire. Remove excess wire as in FIG 4.

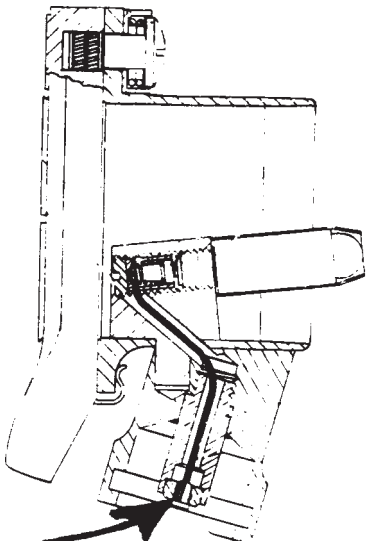


FIG. 4

20100, 20150 Otoscope Reassembly Continued

E8.	Lens	—	Install lens in window assembly and secure with lens retainer. Screw and tighten lens retainer with tool T-847. Install new gasket seal on lens window assembly.
E9.	Window Assembly	—	Assemble spring cup screw through washer, spring and spring cup. Attach lens window assembly to otoscope.
E10.	Lamp	—	Screw lamp into light carrier. Slide lamp hood over lamp. Clean lamp. Inspect. Perform Pneumatic Test A01303.

End 20100, 21050 Reassembly

F. 20200 (20201 without Speculum) 3.5v Otoscope Disassembly:
20250 (20251 without Speculum) 3.5v Otoscope Disassembly:

F1.	Lamp	—	Pull lamp out of base of scope.
F2.	Window Assembly	—	Unscrew spring cup screw. Remove spring cup, spring, and wear plate. Remove window assembly.
F3.	Lens	—	Unscrew lens retainer. (Use lens window wrench tool T-847) remove lens. Remove and discard gasket.

**** 20200, 20250 Reassembly ****

F4.	Lens	—	Install lens in window assembly and secure with lens retainer. Screw and tighten lens retainer with tool T-847. Install new gasket seal on lens window assembly.
F5.	Window Assembly	—	Assemble spring cup screw through washer, spring and spring cup. Attach lens window assembly to otoscope.
F6.	Lamp	—	Clean lamp and press lamp into base of scope. Inpect. Perform Pneumatic Test A01303.

End 20200, 20250 Reassembly

G. 20202 (20203 without Speculum) 3.5V Otoscope Disassembly:
20262 (20263 without Speculum) 3.5V Otoscope Disassembly:

G1.	Lamp	—	Pull lamp out of base of scope.
G2.	Double Viewer Assembly	—	Loosen knurled ring and remove double viewer assembly. Remove ‘o’ ring from body & light pipe assembly.
G3.	Lenses	—	Unscrew both lens retainers and remove both lenses.
G4.	Liner Blank	—	Pull liner blank out with finger tip.
G5.	Beam Splitter Subassembly	—	Unscrew 2-56 x 3/32' set screw. Pull beam splitter subassembly out.
G6.	Window	—	(For broken or scratched windows only) remove window retaining ring and window from double viewer assembly. Remove RTV from window area.

**** 20202, 20262 Reassembly ****

G7.	Window	—	Clean window and apply RTV sealant and install new window. Secure with window retaining ring.
G8.	Beam Slpitter Subassembly	—	Clean mirror carefully on both sides. Insert beam splitter sub-assembly into long end of double viewer subassembly and align to create view for side view port. Secure with 2-56 x 3/32' set screw.
G9.	Liner Blank	—	Insert liner blank into side view port.
G10.	Lenses	—	Clean lens and place lens on double viewer subassembly with convex surface out / flat side in. Determine that lens is centered over port and then screw on lens retainer and finger-tighten. Repeat for other lens.

G11.	Double Viewer Assembly	—	Install new ‘o’ ring on body & light pipe assembly. Attach double viewer subassembly to body & light pipe assembly. Fingertighten knurled ring.
G12.	Lamp	—	Clean lamp and press lamp into base of scope. Inspect. Perform Pnuematic Test A01303.

End 20202, 20262 Reassembly

H. 21600 (21601 without Speculum) 2.5v Otoscope Disassembly:
(Above otoscope is WIRED and not fiber-optic).

H1.	Lamp	—	Unscrew lamp.
H2.	Lens Holder Assembly	—	Unscrew lens holder screw. Remove lens holder spring washer, 2 lens holder washers, and lens holder.
H3.	Speculum Holder	—	Unscrew lock nut clockwise from patient side perspective. Remove prism screw (set screw). Remove speculum holder.
H4.	Lock Nut	—	Remove 2 lock ring halves. Remove lock nut.
H5.	Contact Assembly	—	Remove bayonet contact. Unscrew bayonet assembly and pull off of wire. (Wire is sealed into the bayonet assembly with RTV silicone sealant. Therefore, do not remove bayonet contact and assembly unless you are planning to replace the contact assembly). Pull out old contact assembly and wire. Clean out RTV from both the bayonet and the body assembly.

H6. Contact Assembly — See FIG. 5. Position the wire downwards relative to the replacement contact assembly. Insert the wire into the threaded hole (lamp socket) and guide it down into the small hole in the bottom of the lamp socket. See FIG.6. It will come out of the bottom of base as you push it in. Insert the contact assembly while gently pulling on the end of the wire.

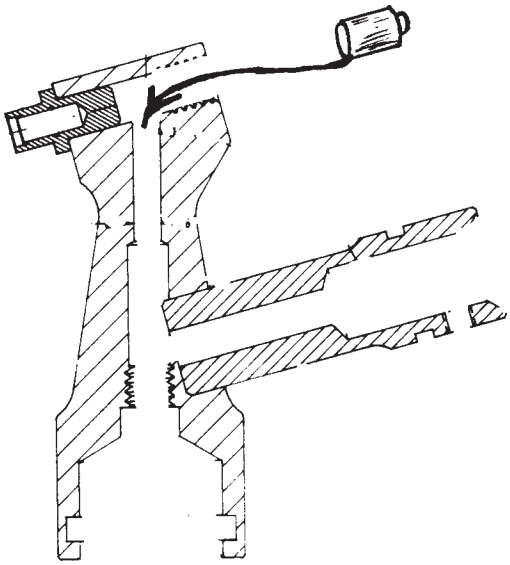


FIG. 5

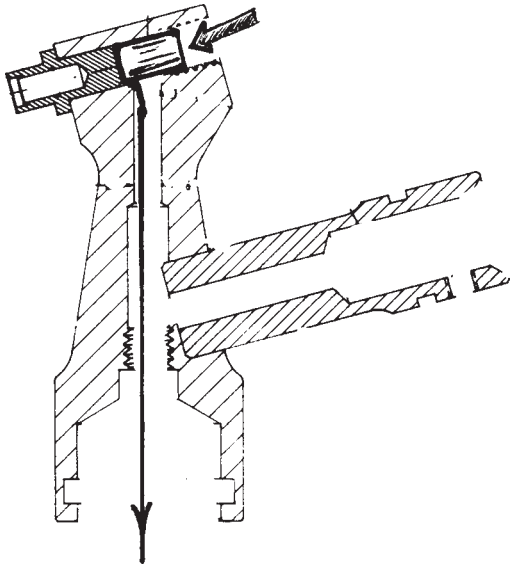


FIG.6

H7. Bayonet Assembly — Insert wire through the bayonet assy. Fill with medical grade RTV sealant. Screw bayonet assy into scope while carefully applying slight tension on the wire to remove excess wire from the scope.

H8. Bayonet Contact — Remove insulation from the wire that protrudes from the end of the bayonet assembly. Press bayonet contact into the small hole in the end-insulation of the bayonet assembly so that it has a good electrical connection to the wire ends. Remove excess wire as in FIG. 7.

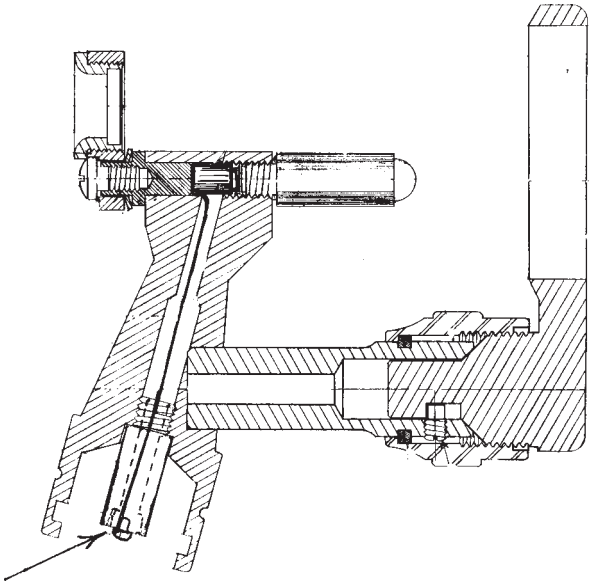


FIG. 7

H9.	Lock Nut	—	Place lock nut over body assembly stem. Insert speculum holder into stem of body assembly in 'up' position. Insert prism screw and tighten. Place 2 lock ring halves in groove of stem and slide lock ring toward speculum holder and finger tighten.
H10.	Lens Holder Assembly	—	Place lens holder spring washer onto body assembly. Place lens holder assembly over washer (with lens recess towards doctor side). Fasten it with lens holder screw and 2 lens holder washers.
H11.	Lamp	—	Screw lamp into light guide. Clean lamp. Inspect.

End 21600 Reassembly

I. 21700 (21701) 3.5V Otoscope:

I1.	Lamp	—	Pull lamp out of base.
I2.	Lens Holder Assembly	—	Unscrew lens holder screw. Remove lens holder spring washer, 2 lens holder washers, and lens holder.
I3.	Speculum Holder	—	Unscrew lock nut clockwise from patient side perspective. Remove prism screw (set screw). Remove speculum holder.
I4.	Lock Nut	—	Remove 2 lock ring halves. Remove lock nut.
I5.	Lamp Collar	—	Remove lamp collar. (Use tweezers)

**** 21700 Reassembly ****

I6.	Lamp Collar	—	Insert replacement lamp collar into body subassembly base (points up).
I7.	Lock Nut	—	Place lock nut over body assembly stem. Insert speculum holder into stem of body assembly in 'up' position. Insert prism screw and tighten. Place 2 lock ring halves in groove of stem and slide lock ring toward speculum holder and finger tighten.
I8.	Lens Holder Assembly	—	Place lens holder spring washer onto body assembly. Place lens holder assembly (with recess towards doctor-side) over washer and fasten it with lens holder screw and 2 lens holder washers.
I9.	Lamp	—	Clean lamp and insert into base. Inspect.

End 21700 Reassembly

APPENDIX
TOOLS/MATERIALS/SUPPLIES
OTOSCOPE

Bayonet Pliers (Welch Allyn T-10802)
Lens Window Wrench (Welch Allyn T-847)
Strap Wrench (Welch Allyn T-10913)
Flat Blade Screwdriver ie. Xcelite # P-181
Long Nose Pliers ie. Xcelite # 52cg 152mm
Tweezers (Stainless Steel or Plastic, must be Non-Magnetic, Grobet Peer # 7)
12"X 12" (Approximately) Foam Pad
Windex™ Glass Cleaner or Vestal Glass Cleaner #8618-21
Lint Free Wipes / Swabs
Jewelers Screwdriver with 1/16" Flat Blade ie. General #3 (.055")
Small Ultrasonic Bath ie: * Pro-Craft Model 23.577-1 *
Ultra Sonic Bath Cleaning Solution ie: Micro™ Liquid Laboratory Cleaner.
Miller Stephenson Aero-Duster #MS-222
De-Ionized Water.
Small Stainless Steel Tubs (1 Qt. Capacity or Less)
Silicone RTV Sealant (Dow Medical Adhesive Silicone Welch Allyn M-30380) or (G.E. Translucent RTV 108)
Insufflator/Tube/Tip (Welch Allyn # 21504)
Glass Beaker (Approx. 1 Qt. Capacity)
Wire Stripper For 22-30AWG Wire ** (Ideal #45-217) **

Tap/Drill/Key:	Tap	Drill	Key
	2-56	#50 (.070")	.035
	3-48	#47 (.0785")	.050
	4-40	#43 (.0890")	.050

* Pro-Craft/GFC Co., Carlstadt, New Jersey, 07072 U.S.A.
** Ideal Industries Inc., Sycamore, Ill. Model #45-217 'T'-stripper. From catalog: Contact-East Inc., 335 Wilow St., North Andover, Ma, 01845. Ph. (508) 682-2000.

APPENDIX

Inspections for Repaired Otoscopes:

1. Check fit of disposable and re-useable speculums.

2. Check to see that instrument fits on handle before repairing. Base rim may be bent if dropped on hard surface.

3. If applicable, perform Otoscope Pneumatic Test appropriate for this Otoscope. See Appendix.

4. Check windows and lenses for cracks, chips or other defects. Check for any stray light that interferes with the viewed image.

5. Check the scope for scratches, physical damage, rough surface before repairing.

6. Clean the repaired scope and wrap it in plastic to protect it from dust and fingerprint contamination.

TROUBLESHOOTING OTOSCOPES

Instrument: Otoscope
Model #: 20000, 24020, 25020, (21110, 21130 Pocket)

Problem	Cause	Corrective Action
Low or no light	Blown lamp	Replace lamp
	Wrong lamp	Replace with correct lamp
	Worn fibers	Replace body
	Dirt on tip, lens	Clean (See cleaning instructions)
Shadows	Lamp filament	Replace lamp
	Bent at tip (dropped)	Replace body
	Worn fibers	Replace body
Not air tight	Entry worn	Replace body
	Window frame worn	Replace window lens
	Body insulator worn	Replace body *(For leaking* 21110 Replace gasket)
Body apart	Retaining ring is loose on 240, 250	Turn ring counter clockwise to tighten (Replace head if ring is still loose)
	Nose ring detached (dropped or worn)	Replace body (new style eliminated nose ring)
	Cracked (dropped)	Replace body
Spec is loose	Worn spec	Try new if still too loose, replace body.
	Tip bent	Replace body
Illuminator or base loose	Worn	Test connection on base with a 'known good' handle and body assembly. Replace the worn part (base, body, or handle).
	Set screws missing, loose (old style)	Tighten or replace screws.
Lamp falls out	Lamp collar is loose or missing	Replace lamp collar

TROUBLESHOOTING OTOSCOPES

Instrument: Otoscope (Pneumatic)
Model #: 20100 (2.5 Volt), 20200 (3.5 Volt)

Problem	Cause	Corrective Action
No light	Blown lamp	Replace lamp
	Wrong lamp	Replace with correct lamp
	For 20100 a) worn contact b) short in wire	Rewire
Not air tight	Window assembly a) worn gasket b) lens is loose c) body is bent	 Replace gasket Tighten retainer Replace body
	For 20200 a) light pipe loose b) speculum worn c) valve stem loose (unsoldered)	 Tightens set screw Replace speculum Replace body Retest
Window apart	Set screw stripped	Replace screw assembly
	Lens broken	Replace lens
	Crack in window subassembly	Replace window subassembly
Low light output	Out of lamp filament alignment	Replace lamp
	Defective power handle	Check otoscope on a known good handle
	20200 Light pipe a) worn fibers b) incorrect light pipe alignment	Replace body assembly
Poor connection	Bent (dropped)	Replace body assembly with power source. Worn base (loose)
	Lamp not inserted	Push lamp in until it fully snaps into place.
	Lamp is loose	Change lamp collar.

NOTE: When changing from 'old style' metal frame window assembly to new style, replace screw asssembly with new. (The old assembly strips easily).

TROUBLESHOOTING OTOSCOPES

Instrument: Otoscope
Model #: 21600, 217OO

Problem	Cause	Corrective Action
Low or no light Light flickers	Blown lamp	Replace lamp
	Wrong lamp	Replace with correct lamp
	Worn contact (216)	Re-wire
	Worn fibers (217)	Replace body
Speculum loose	Speculum or holder is worn	Test with new spec - replace worn part
Speculum holder loose	Threads of speculum or lock nut worn	Replace
	Lock nut loose	Tighten lock nut (allow speculum to move left to right and hold position). Test by repeat movement to see if spec holder has loosened.
	Speculum cracked	Replace speculum
Light not centered	Lite pipe (217) bent or loose	Replace body subassy
	Spec holder bent (old style metal)	Replace holder (Use test pattern).
	Lamp filament not centered	Replace lamp (Use test pattern).
Lens holder assy is loose/apart	Lens holder screw is stripped or worn.	Replace screw and washers
	Posts damaged or unsoldered/bent	Replace body
Poor connection power source	Base bent (dropped)	Replace body
	Base worn (loose)	Replace body (Test with 'known good' handle, or if available, the customer's handle).

NOTE: Check top cover of lite pipe for cracks. If cracks are found, replace body.

Otoscope Pressure Testing form A02800

Otoscope Pneumatic Test (Using Fixture T7503)

- Connect specula tip to otoscope.
- Connect surgical tubing to insufflator fitting.
- Ensure Validyne Model PS309 is “ON”.
- Ensure slide plunger is pushed in all the way.
- Push reset valve button to release any built up pressure.

Pressure Test

- Before & during testing tighten ring on window assembly with T847 as needed.
- Pull actuate lever out all the way. Meter must read a minimum of 22.
- Make sure lever remains all the way out while reading is taken.
- Push reset button in until meter reads O.
- Rotate window 2 full revolutions and repeat air test.

Suction (Vacuum) Test

- Push actuate lever in all the way. Meter must read a minimum of 22.
- Make sure lever remains all the way in while reading is taken.

Otoscope Pressure Testing from A00181

Equipment:

1. Low volume air pump (Aquarium style or equal)
2. Bleeder valve
3. Flow control
4. ”U” tube 12" min. Manometer filled with water and Meriam 1000 green fluid concentrate or equivalent. Fill to line (“0”)
5. Various hoses, tees, and connectors. See T1217 for details

Procedure:

1 A Energize pump

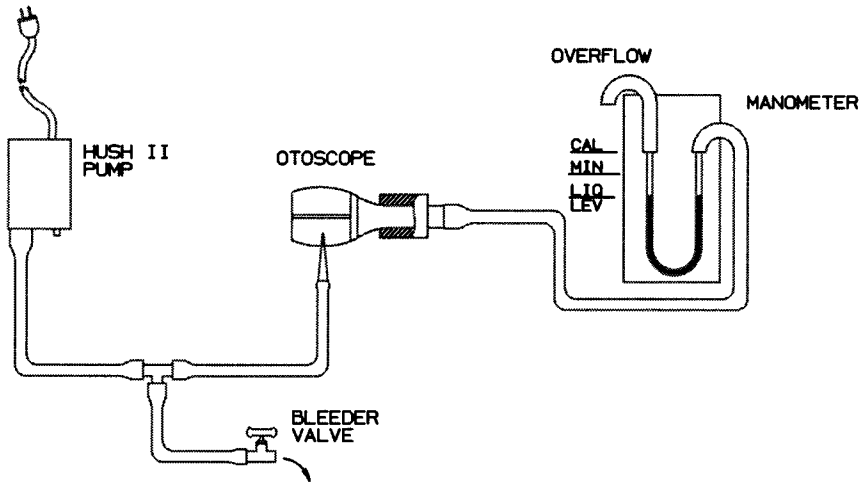
B Set input flow control to .3-.5SCFH (Dwyer RMA-1-SSV)

2 Put insufflation tip (attached to hose) into block. Adjust Bleeder valve until liquid level reaches CAL (calibrate) line. This is equivalent to 0.4PSI on a pressure gage (11.08" h2o on manometer). Reference check for flow rate: from 0 to “CAL” line 3-4 seconds should elapse.

3 Insert metal tip of otoscope into an adapter block and plug taper fitting into insufflation port.

- All scopes must be AT or ABOVE Min (Minimum) line of 3.45" h2o read on manometer to be acceptable for air seal.
- (The requirement is approximately .25PSI which equates to a total displacement of 6.9" h2o.)
- Conversion reference 1 PSI = 27.7" h2o @ 62EF (For this spec no compensation necessary for temp)

Schematic


OVERFLOW
MANOMETER
HUSH II
PUMP
OTOSCOPE
CAL
MIN
LIQ
LEV
BLEEDER
VALVE

Section 5

ILLUMINATED BIVALVE NASAL SPECULUM

MODEL #	PAGE
26000	1-3

Illuminated BiValve Nasal Speculum

Special Instructions:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog 900299. Clean all returned Nasal Speculums by wiping with a solution of 10% Clorox / 90% Water. Begin with a thorough inspection to understand the customer complaint and its cause.

26000 Disassembly: 2.5 Volt

1.	Lamp	—	Unscrew lamp.
2.	Light Carrier Base Assembly	—	Pull bivalve nasal spec assembly off of base.
3.	Handle Speculum	—	Unscrew hinge pin. Remove hinge spring, and handle speculum.
4.	Contact Assembly	—	Pull bayonet contact out of bottom of bayonet assembly. Unscrew and remove bayonet assembly from light carrier base subassembly. Remove old contact assembly and small contact spring (underneath contact assembly) from lamp socket of light carrier base subassembly. Use thin needle-point awl and tweezers. Pull old contact assembly and wire from light carrier base subassembly and inspect to make sure there is no debris left in wire channel or lamp socket.

**** 26000 Reassembly ****

5.	Contact Assembly	__	Put contact assembly wire through contact assembly spring (PN 383065) and position spring under contact assembly. Insert contact assembly wire into lamp socket and push wire through bottom of light carrier base assembly. Grab end of wire with tweezers when it is visible in the base. Pull it up with tweezers so that the contact assembly goes to the bottom of the lamp socket.

6.	Bayonet Assembly	—	Insert wire through the bayonet assembly. Screw the bayonet assembly into the base while carefully applying slight tension on the wire to remove excess wire (slack).
7.	Bayonet Contact	—	Remove insulation from the wire that protrudes from the end of the bayonet assembly. Press bayonet contact into the small hole in the end-insulation of the bayonet assembly so that it has good electrical contact with the wire. Remove excess wire strands with X-acto knife.
8.	Handle Speculum	—	Assemble spring into the hinge slot of the handle speculum. Position the ends of the spring downwards in the direction towards the base. The spring does not stay in the slot, slightly bend the walls of the slot together so the spring is retained. Assemble the handle speculum to the base speculum and insert hinge pin into clearance hole (unthreaded hole), and through spring. Tighten hinge pin.
9.	Light Carrier Base Assembly	—	Press bivalve nasal spec ass'y onto base.
10.	Lamp	—	Screw lamp into lamp socket. Clean lamp. Perform tests.

End 26000 Reassembly

APPENDIX
TOOLS/MATERIALS/SUPPLIES
Nasal Specs 26000

Bayonet Pliers (Welch Allyn T-10802)
Needle Point Awl
Flat Blade Screwdriver ie. Xcelite # P-181
Needle Nose Pliers ie. Xcelite # 52cg 152mm
Tweezers (Grobet Peer # 7)
12"X 12" (Approximately) Foam Pad (Mouse Mat™ American Covers Inc.)
Windex™ Glass Cleaner Or Vestal Glass Cleaner #8618-21
Lint Free Wipes
Wire Stripper (Ideal Industries*, Model #45-217 'T-stripper')
X-acto Knife W/#11 Blade

* Ideal Industries, Sycamore, Ill. avaliable through catalog of Contact East Inc., 335 Willow St.,North Andover, MA, 01845
ph. (508) 682-2000

Section 6

LARYNX ILLUMINATOR
NASOPHARYNX ILLUMINATOR

MODEL #	PAGE
27000	1-2
27050	1-2
27200	1-2
27250	1-2

Illuminator

Special Instructions:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog 900299. Clean all returned instruments by wiping with a solution of 10% Clorox / 90% Water. Begin by thoroughly inspecting to determine the cause and effect of the malfunction and how it relates to the customer complaint.

27000, 3.5Volt Larynx Illuminator,
27050, 3.5Volt Nasopharynx Illuminator,
27200, 2.5Volt Larynx Illuminator,
27250, 2.5Volt Nasopharynx Illuminator Disassembly:

1.	Lamp	—	Pull lamp from base.
2.	Lamp Collar	—	Remove lamp collar. (Use tweezers)
3.	Mirror Section	—	Unscrew knurled ring. Remove mirrorsection from transilluminator assembly. Inspect mirror for defects.

**** 26000, 27050, 27200, 27250 Reassembly ****

4.	Mirror Section	__	Slide mirror section on to transilluminator assembly. Thread knurled ring finger-tight.
5.	Lamp Collar	—	Insert lamp collar into lamp socket. Position collar with points towards top of instrument.
6.	Lamp	—	Clean lamp. Press lamp into lamp socket perform tests.

End 26000, 27050, 27200, 27250 Reassembly

TOOLS

Tweezers (Grobet Peer #7)

TROUBLESHOOTING ILLUMINATORS

Instrument:	Larynx Illuminator	Nasopharynx
Model #:	27000,27200	27050,27250

Problem	Cause	Corrective Action
Broken, bent or scratched mirror	Dropped Improperly stored	Replace mirror section.
Poor connection with handle	Dropped (bent base) Worn base (loose)	Replace illuminator section.
Lamp falls out	Loose lamp collar Lamp collar missing	Replace lamp collar. Install lamp collar.
Image is not centered	Defective lamp (filament is off center) Mirror stem bent Not properly aligned	Replace lamp. Bend stem slightly to the correct angle (see diagram). Position light spot to project through aperture in mirror. Bend carefully to avoid breaking the solder connection. NOTE: Do not remove mirror screw assembly. Mirror could fall off.

Section 7

TONGUE DEPRESSOR

MODEL #	SUB-SECTION	PAGE
28000	A	1-2
28100	B	2-3

TONGUE DEPRESSOR

Special Instructions:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog 900299. Clean all returned instruments by wiping with a solution of 10% Clorox /90% Water. Begin by thoroughly inspecting to determine the cause and effect of the malfunction and how it relates to the customer complaint.

A. 28000 2.5Volt Disassembly:

A1.	Lamp Hood	—	Pull lamp hood from lamp.
A2.	Lamp	—	Unscrew lamp.
A3.	Thumb Screw	—	Unscrew thumbscrew.
A4.	Contact Assembly	__	Remove bayonet contact. Unscrew bayonet assembly and pull off of wire. Unscrew retaining screw with tool T11282. Remove pipe assembly. Remove retaining screw, contact assembly, small rubber tube.

**** 28000 Reassembly ****

A5.	Contact Assembly	__	Assemble rubber tube onto wire of contact assembly and insert contact assembly into retaining screw. Insert new contact assembly/retaining screw into chrome barrel of body assembly. Insert contact assembly wire into threaded hole of pipe assembly and push all the way through the curved pipe. (If the wire kinks while trying to push it through, use a tweezers to push the wire. Insert the wire into the base hole of the body assembly and pull it out of the base with a straight tweezers.

28000 Reassembly Continued

A6.	Pipe Assembly	—	Position the pipe assembly up to the back of the chrome barrel and secure it by tightening the retaining screw with tool T-11282.
A7.	Bayonet Assembly	__	Insert wire through the bayonet assembly. Screw bayonet into scope while carefully applying slight tension on the wire to remove slack.
A8.	Bayonet Contact	—	Remove insulation from the wire that protrudes from the end of the bayonet assembly. Press bayonet contact into the small hole in the end-insulation of the bayonet assembly so that it has good electrical contact with the wire. Remove excess wire.
A9.	Thumbscrew	—	Screw thumbscrew into threaded hole.
A10.	Lamp	—	Screw lamp into light carrier. Slide lamp hood over lamp. Clean lamp.

End 28000 Reassembly

B. 28100 3.5Volt Disassembly:

B1.	Lamp Hood	—	Unscrew lamp hood. Lamp will come off with lamp hood.
B2.	Lamp	—	Remove lamp from lamp hood.
B3.	Thumb Screw	—	Unscrew thumbscrew.
B4.	Contact Assembly	__	Remove bayonet contact. Unscrew bayonet assembly and pull off of wire. Unscrew set screw (0-80 x 1/8" long). (Use 028" hex key). Unscrew retaining screw with tool T-2187 (double 'tee' wrench). Remove pipe assembly. Remove contact assembly, small rubber tube.

**** 28100 Reassembly ****

B5.	Contact Assembly	__	Assemble rubber tube onto wire of contact assembly and insert contact assembly into retaining screw.Insert new contact assembly/retaining screw into chrome barrel of body assembly. Insert contact assembly wire into threaded hole of pipe assembly and push all the way through the curved pipe. (If the wire kinks while trying to push it through, use a tweezers to push the wire.Insert the wire into the base hole of the body assembly and pull it out of the base with a straight tweezers.
B6.	Pipe Assembly	—	Position the pipe assembly up to the back of the chrome barrel and secure it by tightening the retaining screw with tool T-2187. Insert and tighten set screw to secure the retaining screw.
B7.	Bayonet Assembly	__	Insert wire through the bayonet assembly. Screw bayonet into scope while carefully applying slight tension on the wire to remove slack.
B8.	Bayonet Contact	—	Remove insulation from the wire that protrudes from the end of the bayonet assembly. Press bayonet contact into the small hole in the end-insulation of the bayonet assembly so that it has good electrical contact with the wire. Remove excess wire.
B9.	Thumbscrew	—	Screw thumbscrew into threaded hole.
B10.	Lamp	—	Clean lamp. Place lamp in lamp holder. Screw lamp holder onto body assembly.

End 28100 Reassembly

Tongue Depressors

APPENDIX

TOOLS/MATERIALS/SUPPLIES

Bayonet Pliers T-10802
Ring Nut Wrench For 28000. (Single'TEE' "Wiring Tool" Drawing #23500877) T-11282
Ring Nut Wrench For 28100. (Double'TEE' "Stud Setting Tool" Drawing #23500373) T-2187
Needle Nose Pliers ie. Xcelite # 52CG 152mm
Tweezers (Stainless Steel or Plastic, Must Be Non-Magnetic, Grobet Peer # 7)
Tweezers (Stainless Steel) Offset 4 1/4" Long (Model A-5ASA)**
12"X 12" (Approximately) Foam Pad (Mouse Mat™ American Covers Inc.)
Windex™ Glass Cleaner or Vestal Glass Cleaner #8618-21
Lint Free Wipes / Swabs
Wire Stripper For 22-30AWG Wire **(Ideal #45-217)**

Tap/Drill/Hex Key:	Tap;	Tap Drill;	Key;
Thumbscrew	6-32	36 (.1065)	Na
Set Screw (PN 281019) 0-80 X 1/8"	0-80	3/64"(.0469)	.028"

Pin Vise for .028 Allen Key Above. (L.S. Starrett Model 166 A)

** Ideal Industries Inc., Sycamore, Ill. Model #45-217 'T'- Stripper.
From Catalog: Contact-East Inc., 335 Willow St., North Andover, Ma, 01845.
Ph.(508) 682-2000.

Section 8

PROCTO-SIGMOIDOSCOPES:
FIBER OPTIC ANOSCOPES
PROCTO-SIGMOIDOSCOPES
FIBER OPTIC LIGHT HEAD
STANDARD ANOSCOPES
ROTATING ANOSCOPES

MODEL #	SUB-SECTION	PAGE
PROCTO-SIGMOIDOSCOPES: 32010 32020 32410 32420 32810 32820 32830 33020 33220 33620 33830	A	1
FIBER OPTIC LIGHT HEAD: 36019	B	2
FIBER OPTIC ANOSCOPE SERIES: 37000	C	2
STANDARD ANOSCOPES 38108 38114 38119 38122	D	3
ROTATING ANOSCOPE: 38800	E	3-4
Tools	Appendix	5
Troubleshooting Model 38800	Appendix	6

Fiber Optic Anoscopes
Procto-Sigmoidoscopes
Fiber Optic Light Head
Standard Anoscopes
Rotating Anoscope

Special Instructions:

Refer to diagrams in Welch Allyn Repair Parts Catalog 900299. Clean returned instruments with a solution of 10% Clorox / 90% water. Begin by thoroughly inspecting to determine the cause and effect of the malfunction and how it relates to the customer complaint.

A. Hinged Window Fiber Optic Procto-Sigmoidoscopes:
32010, 32020, 32410, 32420, 32810, 32820, 32830, 33020, 33220, 33620, 33830

Disassembly: Use T-5319 for 324044 window sub-assembly.
Use T-5320 for 328115-505 " " "

A1.	Window Assembly	—	Remove spirol pin (1/16" x 1/2 ").(Use .060" drift punch and hammer) Collect 2 plungers and 2 plunger springs you slowly remove window from hinge.
A2.	Window Screw	—	Remove retaining spring and remove window screw.
A3.	Window Lens	—	324044, 328115-505: Unscrew window retaining screw with tool. 328115-502, 3, 4 & 332025: Remove snap ring and RTV. Remove window and window gasket.

**** Reassembly ****

A5.	Window	—	Assemble rubber gasket into window door. Insert window lens into recess in gasket seal with convex side on the doctor-side. Secure with window retaining screw. Tighten lightly with tool T-5320.
A6.	Window Screw	—	Insert window screw into hole and secure with retaining spring.
A7.	Window Assembly	—	Insert plunger springs into speculum subassembly.Insert plungers on top of springs. Position window assembly hinge into speculum subassembly hinge. Insert spirol pin into hinge.

End Reassembly

B. 36019 Fiber Optic Light Head Disassembly:

B1.	Window Assembly	—	Remove spirol pin. Collect 2 plungers and 2 plunger springs as you slowly remove window from hinge.
B2.	Window Screw	—	Remove retaining spring and remove window screw.
B3.	Window Lens	—	Unscrew window retaining screw with tool T-5320. Remove window and window gasket.

**** 36019 Reassembly ****

B5.	Window	—	Assemble rubber gasket into window door. Insert window lens into recess in gasket seal with convex side on the doctor-side. Secure with window retaining screw. Tighten lightly with tool T-5320.
B6.	Window Screw	—	Insert window screw into hole and secure with retaining spring.
B7.	Window Assembly	—	Insert plunger springs into speculum subassembly. Insert plungers on top of springs. Position window assembly hinge into speculum subassembly hinge. Insert spirol pin into hinge. Inspect/test.

End 36019 Reassembly

C. 370 Series Fiber Optic Anoscopes Disassembly:

C1.	Obturator Assembly	—	Remove obturator assembly.
C2.	End Piece	—	Unscrew end piece from anoscope subassembly.

** 370 Series Reassembly **

C3.	End Piece	—	Screw end piece onto anoscope subassembly.
C4.	Obturator Assembly	—	Insert obturator into anoscope subassembly.

End 370 Series Reassembly

D. 38108, 38114, 38119, 38122 Standard Anoscopes Disassembly:

D1.	Obturator Assembly	—	Pull obturator out of funnel assembly reassembly.
D2.	Obturator Assembly	—	Insert obturator assembly into funnel assembly from the doctor-side.

E. 38800 Rotating Anoscope Disassembly:

E1.	Obturator Assy.	—	Remove obturator assembly.
E2.	Light Carrier Assembly	—	Pull light carrier assembly down and out of ring assembly.
E3.	Speculum Assembly	—	Pull knurled rotation knob upwards and hold it there while pulling the speculum assembly from the ring assembly.
E4.	Lamp	—	Unscrew lamp.
E5.	Contact Ass'y	—	Pull bayonet contact out of bottom of bayonet assembly. Unscrew and remove bayonet assembly from light carrier base subassembly. Remove old contact assembly and small contact spring (underneath contact assembly) from lamp socket of light carrier base subassembly. Use thin needle-point awl and tweezers. Pull old contact assembly and wire from light carrier base subassembly and inspect to make sure there is no debris left in wire channel or lamp socket.
E6.	Pinion Gear	—	Unscrew knob set screw (3-48 screw, use .050" key) and remove knob. Pull pinion gear shaft down. Remove spring and guide.

**** 38800 Reassembly ****

E7.	Pinion Gear	—	Put guide PN 388009 onto pinion gear shaft with bevel against gear. Place spring over shaft and guide. Insert into shaft housing of ring assembly. Attach knurled knob and tighten the set screw (3-48 screw, use .050" key).

E8.	Contact Assembly	__	Put contact assembly wire through contact assembly spring (PN 383065) and position spring under contact assembly. Insert contact assembly wire into lamp socket and push wire through bottom of light carrier base assembly. Grab end of wire with tweezers when it is visible in the base. Pull it up with tweezers so that the contact assembly goes to the bottom of the lamp socket.
E9.	Bayonet Assembly	—	Insert wire through the bayonet assembly. Screw the bayonet assembly into the base while carefully applying slight tension on the wire to remove excess wire (slack).
E10.	Bayonet Contact	—	Remove insulation from the wire that protrudes from the end of the bayonet assembly. Press bayonet contact into the small hole in the end-insulation of the bayonet assembly so that it has good electrical contact with the wire. Remove excess wire strands with X-acto knife.
E11.	Speculum Assembly	—	Pull knurled knob up and insert speculum assembly into ring assembly. Release knob slowly. Turn knob to rotate speculum.
E12.	Lamp	—	Screw lamp into lamp socket. Clean lamp.
E13.	Light Carrier Assembly	—	Press ring ass'y onto base.
E14.	Obturator Assy	—	Insert obturator assembly.

End 38800 Reassembly

APPENDIX
TOOLS/MATERIALS/SUPPLIES

Window Screw Wrench Large (Undercut) (Welch Allyn T-5320)
Window Screw Wrench Small (Undercut) (Welch Allyn T-5319)
Bayonet Pliers (Welch Allyn T-10802)
Drift Pin Punch .060" Diam.
Jewelers Hammer 6 Oz..
Needle Point Awl
Flat Blade Screwdriver ie. Xcelite # P-181
Needle Nose Pliers ie. Xcelite # 52cg 152mm
12"X 12" (Approximately) Foam Pad (Mouse Mat™ , American Covers Inc.)
Windex™ Glass Cleaner Or Vestal Glass Cleaner #8618-21
Lint Free Wipes
Wire Stripper (Ideal Industries*, Model #45-217 'T-stripper')
X-acto Knife W/#11 Blade
Tweezers (Grobet Peer # 7)
Tweezers (Model A-5ASA From Ideal Catalog)**
Insufflation Bulb, Tube (Welch Allyn 30200)
Beaker 500 ML.

Tap/Drill/Key:	Tap	Drill	Key
	3-48	#47 (.0785")	.050"
	4-40	#43 (.0890")	.050"

Pin Vises for Allen Keys above. (L.S. Starrett Model 166 A)

* Pro-Craft/GFC Co. Carlstadt, New Jersey, 07072 U.s.a.

** Ideal Industries Inc., Sycamore, Ill. Model #45-217 'T'-stripper.
From catalog: Contact-East Inc., 335 Willow St., North Andover, MA, 01845.
PH.(508) 682-2000.

TROUBLESHOOTING PROCTO SIGMOIDOSCOPES/ANOSCOPE

Instrument: Rotating Anoscope With 38300 Light Carrier
Model #: 38800

Problem	Cause	Corrective Action
Ring assembly sticks and won't rotate	Teeth worn/broken on ring or speculum assembly	Replace ring or spec.
Obturator won't fit properly	Obturator scratched	Replace if it is sharp
	Handle bent	Replace obturator
	Plating worn	Replace obturator
	Speculum bent	Replace speculum
	For the 38300 Light Carrier	
Intermittent or no light	Defective lamp	Replace lamp
	Worn contact	Rewire
Low light	Lamp out of alignment	Replace lamp
	Stem bent	Bend to correct shape
Anoscope is tight on light carrier (It is difficult to separate).	Light carrier is: a) bent (dropped) b) ball bearing is stuck (corrosion between ball and base from improper cleaning)	Replace ring assembly Replace carrier Clean base of ring assembly (or replace).

Section 9

HEADLIGHTS AND TRANSFORMER

MODEL #	SUB-SECTION	PAGE
46003	A	1-2
46023	A	1-2
46050	A	1-2
49003	B	3-4
49022	B	3-4
49030	B	3-4
49034	B	3-4
49035	B	3-4
49036	B	3-4
790030-501	C	5-6
790030-502	C	5-6
470305	D	7-8
470225	D	7-8
470245	D	7-8
470285	D	7-8

Headlights
and Transformer

The terms POWER SUPPLY, TRANSFORMER, and AC ADAPTOR, are used interchangeably.

Special Instructions:

Clean returned headlights by wiping with a solution of 10% Clorox and 90% water. Do not apply alcohol, chemicals or water to the lens. Use approved lens cleaner only. Perform incoming evaluation to understand cause of the customer complaint.

A. Direct Focusing Headlight NOS. 46003, 46023, 46050.
Disassembly: Transformers PN791003-502, 791054, 791100 are non-serviceable items. Female switch is replaceable.

A1.	Lens Assembly	—	Pull lens assembly from lamp base assembly. Wipe lens with soft cloth and lens cleaning solution. Inspect lens for: secure fit, no scratches or smudges.
A2.	Lamp	—	Old lamps may be shattered, weakened, or break while unscrewing, therefore, use glove or cloth to protect fingers while unscrewing lamp from lamp base assembly. Inspect socket contacts for corrosion and or wear.
A3.	Lamp Base Assembly	—	Unscrew two small screws on the back of the male switch assembly (the switch that is mounted on the headband). Remove the plastic back plate and the male switch assembly. Unclip the connecting wire from under the headband wire clip. Unscrew the small wing nut on the headlight support. Remove the lamp base from the headband assembly.

A. Direct Focusing Headlight NOS: 46003 (120Volt), 46023 (220Volt), 46050 (250Volt) Disassembly Continued:

A4.	Male Switch Assembly	—	Un-solder two wires from back of male switch assembly and clean wires. Refit the lamp base assembly with a new male switch assembly by re-soldering the long wire to the 'G' terminal and the short wire to the 'W' terminal on the back of the male switch assembly. Use rosin core solder. Do not use acid core solder.
A5.	Pad/Post Assembly	—	Grip ball of post in a vise and cut the (if headband is stem of the post between its flange and in good condition) the aluminum disc. Use a hacksaw. Discard aluminum disc, post, and rubber pad.
A6.	Install Pad/Post	—	Position new post through new aluminum disc and then headband. Put a drop of Loctite 495 on fluted end of post. Press post into new rubber pad. Use smooth jaw vise to press parts together.
A7.	Replace Lamp Base Assembly	—	Position the male switch assembly against the headband with the beveled edge facing up. Secure male switch to the headband assembly with two slotted head screws and plastic back plate. The screw heads should have no sharp edges or burrs after assembly. Lay the wire flat with no twists and secure it under the plastic clip on the headband. Clamp the lamp base assembly by tightening the wing nut.
A8.	Replace Lamp	—	Install clean lamp in lamp base assembly. Push lens assembly onto lamp base assembly. Plug transformer into mains turn it on to see that it works properly.

—End 46003, 46023, 46050 Reassembly—

Halogen Headlight:	49003 (110-130V) & 790030-501*Power Supply 49022 (220-250V) & 790030-502 Power Supply 49030 & 470305 IEC AC Adaptor* 49034 & 470225 IEC AC Adaptor 49035 & 470245 IEC AC Adaptor 49036 & 470285 IEC AC Adaptor

*The terms POWER SUPPLY, TRANSFORMER, and AC ADAPTOR, are used interchangeably.

B. Halogen Headlight: 49003 (110-130 Volt) 49034, 49035, 49036

Disassembly: (Transformers for the 490 series are serviceable items, refer to Section C.)

B1. Lens Assembly — Unscrew main housing assembly from reflector socket assembly. Wipe lens with soft cloth and lens cleaning solution. Inspect lens for: Secure fit, no scratches or smudges. (Do not disassemble the main housing assembly.)

B2. Lamp — Old lamps may be shattered, weakened, or break while removing, therefore, use glove or cloth to protect fingers while twisting lamp from socket. Inspect socket contacts for corrosion and or wear. They should have about 1/8" of spring to them.

B3. Reflector Socket Assembly — Unscrew two small screws on the back of the male switch assembly (the switch that is mounted on the headband). Remove the plastic back plate and the male switch assembly. Unclip the connecting wire from under the headband wire clip. Unscrew the small wing nut on the headlight support. Remove the reflector socket assembly from the headband assembly.

B4. Male Switch Assembly — Un-solder two wires from back of male switch assembly and clean wires. Refit the reflector socket assembly with a new male switch assembly by re-soldering the long wire to the ‘R’ terminal and the short wire to the ‘W’ terminal on the back of the male switch assembly. Use rosin core solder.

B. Halogen Headlight/IEC AC adaptors: 49003, 49034, 49035, 49036
Disassembly: (Transformers for the 490 series are serviceable items, refer to Section C.)

B5.	Pad/Post Assembly	—	Grip ball of post in a vise and cut the (if headband is stem of the post between its flange and in good condition) the aluminum disc. Use a hacksaw. Discard aluminum disc, post, and rubber pad.
B6.	Install Pad/Post	—	Position new post through new aluminum disc and then headband. Put a drop of Loctite 495 on fluted end of post. Press post into new rubber pad. Use smooth jaw vise to press parts together.
B7.	Replace Reflector Socket Assembly.	—	Position the male switch assembly against the headband with the beveled edge facing up. Secure male switch to the headband assembly with two slotted head screws and plastic back plate. The screw heads howled have no sharp edges or burrs after assembly. Lay the wire flat with no twists and secure it under the plastic clip on the headband. Clamp the reflector socket assembly by tightening the wing nut.
B8.	Replace Lamp	—	Align pin with slot in socket, and insert lamp and twist clockwise. Clean the lamp with a swab dipped in alcohol. Screw the lens assembly onto the reflector socket assembly. Plug transformer into mains, connect secondary to headband switch and turn transformer on. Inspect shutter for smooth operation.

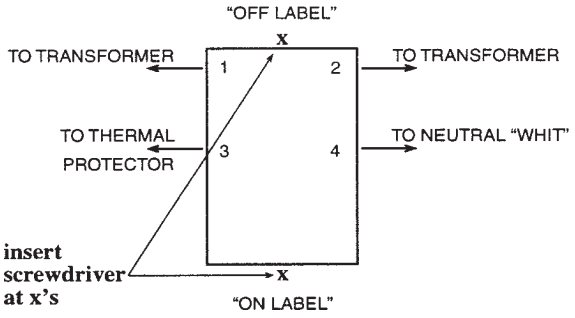
—End 49030, 49034, 49035, 49036 Halogen Headlight Reassembly—

790030-501 (110-130Volt) & 790030-502 (220-250Volt) Power Supplies for 49003 & 49022 Headlight Respectively

C Disassembly

C1. Rocker Switch — Disconnect power supply from mains. Insert small flat blade screwdriver between black spring retainer and chrome clip on the side of the switch (center of the end of the switch). *See Figure 1.* Then twist screwdriver slightly and lift the switch up by its wires as far as it will go on that side. Do the same on the other end of the switch to lift it completely out. Do not remove the black clip as this will be reused for the replacement switch. Cut wires from switch on the switch side of the crimp connectors.

Figure 1
Back of Switch



Note: this diagram is for position reference only. The terminals are not labeled on the Carling Switch.

C2. Restore Wiring (For switch) — Install replacement switch in the housing prior to crimping wires. Position the power switch in the cutout of the case with the 'Off' label towards the Welch Allyn name. Use the same screwdriver as before to spread the black clip to accept the switch as far as it will go. Crimp wires of replacement switch to: Both transformer primary winding leads, line neutral (white line cord wire), and the thermal interrupt safety switch, as per Figure 1 above. Use klein crimper pliers (Klein #1005 or equivalent).

C3. Transformer — Pull transformer from case. Cut crimp connectors from the transformer leads. Unscrew the grounding wire ring terminal from the grounding post. Lift transformer out of case. Note in detail the position and arrangement of all components and wiring.

790030-501 (110-130Volt) & 790030-502 (220-250Volt) Power Supplies for 49003 & 49022 Headlight respectively

C Disassembly Continued

C3. Transformer Continued — The early production versions had the transformer positioned as shown in drawing #790030. Replace components and wiring for your transformer in the same position as it was prior to disassembly. Use klein crimper pliers (Klein #1005 or equivalent). Attach the foam pad from the old transformer to the same position on the replacement transformer (opposite the label). Make sure that wires do not get pinched between the transformer and the case, or between the case and the aluminum cover. See assembly drawing.

C5. Female Switch — Unscrew cover of female switch. Un-solder black and white wires from the switch. Solder wires to replacement switch. Secure cover of female switch with screw. Perform full functional check. Use rosin core solder.

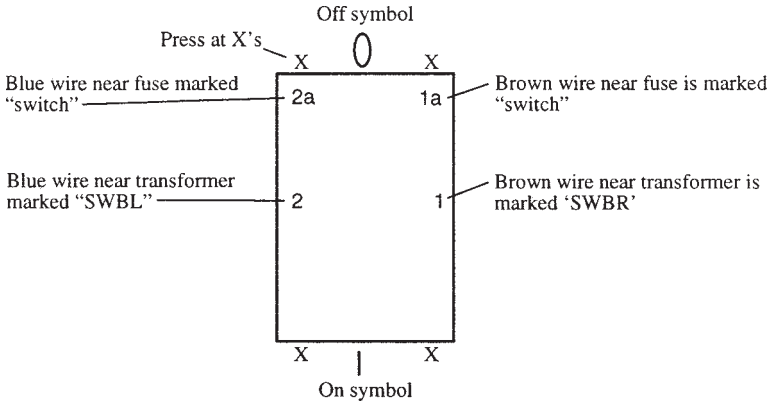
C6. Secondary Cord — Remove Heyco strain relief. Cut old secondary cord near crimp connectors. Remove old cord. Insert replacement cord to case and secure with strain relief. Restore connections by crimping transformer secondary wires to secondary cord. Attach cover of power supply.

—End 790030-501 & 790030-502 Reassembly—

D Disassembly

D1. Rocker Switch — Disconnect IEC AC adaptor from mains. Remove four phillips head machine screws from back of the base. Pull spade connectors from switch and move wires out of the way. Press tabs on rocker switch to remove switch from cover assembly. See Figure 2. Do not cut wires from switch.

Figure 2
Back of Marquardt Switch



D2. Restore Wiring — Install replacement switch in cover assy. Prior to connecting wires. Position the power switch in the cutout of the cover with the 'O' symbol 'UP'. Attach wires to replacement switch per Fig 2.

D3. PC Board Assembly — Disconnect the two power cord (line voltage) wires from PC board wire terminal block locations 1 and 2. Unscrew four phillips head screws from PC board. Turn PC board over and unsolder the two secondary wires (black and blue) from the trace side of the board. Note: It is not necessary to remove the gray fiber insulation from the base assembly.

D4. Replace PC Board — Solder* the secondary black and white wires onto the PC board at locations marked 'output' with the white wire nearer the transformer. Make sure there is an insulation board in the base assembly. Attach line cord wires: Blue to #1 and brown to #2. Attach board with 4 phillips head screws and star washers.
*Use rosin core solder.

D Disassembly Continued

D5. Female Switch — Unscrew cover of female switch. Un-solder black and white wires from the switch. Solder wires to replacement switch with rosin core solder. Secure cover of female switch with screw. Perform full functional check. Use rosin core solder.

D6. Secondary Cord — Remove cover assembly and loosen PC board. Loosen the strain relief screw nearest the transformer. Unsolder old secondary cord at the board. Remove old cord. Insert replacement cord through strain relief and secure with strain relief screw. Attach cover assembly.

D7. Power Cord — Remove cover assembly and loosen power cord strain relief screw. Loosen two terminal screws and remove brown and blue wires from the terminal block. Prepare the end of the replacement power cord by removing outer insulation from approximately two inches of the cord. Strip 1/4 inch of the two wires. Attach line cord wires: Blue to #1 and brown to #2. Before tightening the strain relief screw, make sure there is a little slack (approximately 1/2 inch to 3/4 inch) in the base. Secure power cord with strain relief set screw. Perform full functional check.

D8. Fuse — Check the PC board fuse prior to replacing the board. Replace fuse with original equipment type according to parts list. Only use IEC 5 x 20 mm time delay fuses. See printed chart in cover assembly.

TOOLS / MATERIALS / SUPPLIES

Tweezers (Grobet Peer #7 Stainless Steel or Equivalent)
Miller Stephenson Aero-Duster #MS-222 (or Equivalent)
Soldering Iron, 80W Unger #3180 (or Equivalent)
Screwdriver, 1/8" Flat Blade
Screwdriver, #0 and #2 Phillips
Terminal Crimpers, (Klein #1005 or Equivalent)
Wire Cutter, (Xcelite 107cg or Eqivalent)
Heyco #29 Tool For Nos. 6P3-4 and #2M-4 Strain Reliefs.
Wire Stripper, (Xcelite 105scg or Equivalent)
Windex™ Glass Cleaner or Vestal Glass Cleaner #8618-21
Lint Free Wipes / Swabs
Solder. (Rosin Flux Core)

INSPECTIONS FOR REPAIRED HEADLIGHTS

1. Operate:switches, adjust the headlight positioning wing nut, focus mechanism. These should operate smoothly. Headlight should stay in position once adjusted and tightened.

2. Lenses and bulb should be free of smudges, scratches, dirt.

3. Check projected images for shadows, dirt, and filament images. The light beam should focus to an even white spot.

4. Switch (on headband) should operate smoothly and provide positive on/off operation. Switch on the 79003 transformer operates properly, including pilot light in rocker.

5. Lamp should not flicker when cord is flexed along its entire length.

6. The wing nut, and plastic back plate retaining screws (2) should be free of burrs or sharp points.

7. The pad and headband should be free of sharp edges.

8. The brass contact(s) and/or screw threads of the lamp socket should be free of corrosion and copper oxide.

9. (For the 49030, 49034, 49035, 49036) The two brass screws in the reflector socket assembly are tight and making good contact with the ring terminals and contacts. ON/OFF switch operates correctly.

Section 10

EPISCOPE

MODEL #	PAGE
47300	1-4

Episcope

Clean all returned Episcopes by wiping with a solution of 10%CLOROX / 90% WATER. Use special tools, lens cleaner, and lens tissue as listed in appendix. Do not apply alcohol, chemicals or water to the window assemblies or lens, or immerse in any solvent that will attack or dissolve Molykote 33 grease. Begin with a thorough inspection to understand any customer comments and their causes.

" *SLP* " appears in the instructions occasionally and means Small Loose Parts. It is a reminder to disassemble carefully, reducing the chances of losing small parts. Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog 900299.

47300 Disassembly:

1.	Lamp	—	Pull lamp from base. (Use bayonet pliers T-19892 or tweezers).
2.	Front Window	—	Pull front window assembly straight off of the scope/ lens assembly.
3.	Rubber Eyepiece	—	Pull the eyepiece off of the scope.
4.	Rotating Collar	—	Loosen all three 2-56 x 1/8" set screws (use .035" hex key) approximately two and one half (2 1/2) turns. Remove the rotating collar assembly.
5.	Lens Cylinder	—	Unscrew the 2-56 flat head machine screw (FHMS). *SLP* Pull the lens cylinder out of the episcope body. Remove the cam follower from the groove on the side of the lens cylinder. Remove the teflon strip. Clean and degrease sliding parts. Clean the two outer surfaces of the lenses. Regrease cam follower groove with light coating of Molykote 33 grease (Welch Allyn part number M-11041).

47300 Disassembly Continued

6.	Lamp Collar	—	(Removal will cause damage to lamp collar. Replace with new collar). Place a thin flat blade screwdriver into the lamp channel via the Episcope head and push the lamp collar out the bottom of the scope.

** 47300 Reassembly **

7.	Lamp Collar	—	Insert the replacement lamp collar points first, into the bottom of the scope and slide it into place.
8.	Lens Cylinder	—	Insert teflon strip into Episcope body with screw hole aligned in both the Episcope body and the teflon strip. Insert the cam follower into the greased cam follower groove at the lock ring end of the lens cylinder. Position the cam follower so that it conforms to the cylindrical shape (curve) of the lens cylinder. Insert the lens cylinder into the Episcope body 'lock ring first'. Align the screw hole in the lens cylinder with the screw hole in the Episcope body. Insert the 2-56 FHMS and tighten finger tight (12 in.oz. +-4 in.oz.), (use .035" hex key).
9.	Rotating Collar	—	Put the rotating collar over the lens cylinder and tighten the three 2-56 x 1/8" set screws. They will seat into the groove of the lens cylinder. The doctor side surface of the rotating collar must be flush with the doctor side surface of the lens cylinder.
10.	Rubber Eyepiece	—	Press the rubber piece onto the rotating collar evenly.
11.	Lamp	—	Clean replacement lamp and press straight into the base of the scope.
12.	Front Window	—	Clean the front window and press it onto the patient side of the scope. Attach scope to 3.5v handle and test.

End 47300 Assembly

EPISCOPE

TOOLS/MATERIALS/SUPPLIES

Bayonet Pliers (Welch Allyn T-10802)
Strap Wrench (Welch Allyn T-10913)
Tweezers (Stainless Steel or Plastic, Must Be Non-Magnetic, Grobet Peer # 7)
12"X 12" (Approximately) Foam Pad (Mouse Mat™ American Covers Inc.)
Windex™ Glass Cleaner or Vestal Glass Cleaner #8618-21
Lint Free Wipes / Swabs
Aero-Duster #MS-222
Moly Kote 33 Grease (Welch Allyn M-11041)
Pin Vise “C” Size (L.S. Starrett Co. #166C) For Drills/Taps
Jewelers Screwdriver With 1/16" Flat Blade

Tap/Drill/Key:	Tap	Drill	Key
	2-56	#50 (.0700")	.035"
	3-48	#47 (.0785")	.050"
	4-40	#43 (.0890")	.050"

Inspections For Repaired Episcopes:

1. Attach the Episcope to a Welch Allyn 3.5volt power source.

2. Activate the scope and adjust to maximum light intensity. Look for anything that would interfere with the viewed image.

3. With the front window attached, check: The light output, cleanliness and scratch free condition of the window and lenses.

4. Check the scope for scratches, physical damage, rough surfaces or burrs on fasteners. (Do this before repairing as well).

5. Clean the repaired scope and wrap it in plastic to protect it from dust and fingerprint contamination.

Section 11

LARYNGOSCOPE HANDLES

MODEL #	SUB-SECTION	PAGE
60200	A	1
60300	B	1-2
60305	C	2-3
60400	D	3
60700	E	3-4
60710	E	3-4
60720	E	3-4
60713	F	4-5
60803	G	5
60804	H	6
60813	I	6-7
60814	I	6-7
60815	J	7-8

Laryngoscope Handles

Refer to diagrams in current Repair Parts Catalog 900299

A. 60200 Disassembly:

A1.	Hook-on Neck	—	Unscrew bottom cap. Remove batteries. Unscrew set screw (2-56) (uses .035" hex key) in hook-on neck. Unscrew hook-on neck.
A2.	Plunger Contact	—	Unscrew center screw. Remove plunger spring and plunger contact.
A3.	Bottom Cap Spring	—	Unscrew bottom cap. Unscrew spring.

** 60200 Reassembly **

A4.	Bottom Cap Spring	—	Screw in replacement spring.
A5.	Plunger Contact	—	Insert plunger contact, plunger spring. Position center screw over spring and tighten.
A6.	Hook-on Neck	—	Assemble hook-on neck sub-assy onto handle tube and tighten. Insert set screw and tighten.
A7.	Batteries	—	Insert 2 “D” cell batteries, (+ end in first.) Assemble bottom cap and tighten.

End 60200

B. 60300 Disassembly:

B1.	Hook-on Neck	—	Unscrew bottom cap. Remove batteries. Unscrew set screw (2-56) in hook-on neck. (Use .035" hex key). Unscrew hook-on neck.
B2.	Plunger Contact	—	Unscrew center screw. Remove small- hole washer, spacer, plunger spring, and plunger contact.

60300 Disassembly Continued

B3.	Bottom Cap Spring	—	Unscrew bottom cap. Unscrew spring.

** 60300 Reassembly **

B4.	Bottom Cap Spring	—	Screw in replacement spring.
B5.	Plunger Contact	—	Insert plunger contact, plunger spring, spacer, small hole washer, and center screw. Tighten center screw.
B6.	Hook-on Neck	—	Assemble hook-on neck subassy onto handle tube and tighten. Insert set screw and tighten.
B7.	Batteries	—	Insert 2 “C” cell batteries, (+ end in first.) Assemble bottom cap and tighten.

End 60300

C. 60305 Disassembly:

C1.	Hook-on Neck	—	Unscrew bottom cap. Remove battery pack assembly. Unscrew (2-56) set screw in hook-on neck. (Use .035" hex key). Unscrew hook-on neck.
C2.	Plunger Contact Old Style	—	Unscrew center screw. Remove small- hole washer, spacer, plunger spring, and plunger contact.
	New Style	—	Replace handle assembly.
C3.	Bottom Cap Spring	—	Unscrew bottom cap. Remove insulator on spring. Unscrew spring.

** 60305 Reassembly **

C4.	Bottom Cap Spring	—	Screw in replacement spring. Assemble insulator on top of the spring.
C5.	Plunger Contact	—	Insert plunger contact, plunger spring, spacer, small hole washer, and center screw. Tighten center screw.

60305 Reassembly Continued

C6.	Hook-on Neck	—	Assemble hook-on neck sub-assy onto handle tube and tighten. Insert set screw and tighten.
C7.	Batteries	—	Insert 2 “AA” cell batteries into battery pack assembly. Insert battery pack into handle assembly in the direction of the arrow. Assemble bottom cap and tighten.

End 60305

— —— —

D. 60400 Disassembly:

D1.	Batteries	—	Unscrew bottom cap and remove 2 “AA" batteries.
D2.	Spring	—	Unscrew spring in bottom cap.
D3.	Insulator Assembly	—	Unscrew insulator assembly. (Use flat blade screwdriver or T-11912)

** 60400 Reassembly **

D4.	Insulator Assembly	—	Insert replacement insulator assembly and tighten until insulator is flush.
D5.	Spring	—	Screw in replacement spring.
D6.	Batteries	—	Insert 2 “AA” batteries. Assemble bottom cap and tighten.

End 60400

— —— —

E. 60700, 60710, 60720 Disassembly:

E1.	Hook-on Neck	—	Unscrew (2-56) set screw in hook-on neck. (Use .035" hex key). Unscrew hook-on neck.
E2.	Top Cap Sleeve	—	Unscrew top cap sleeve from handle tube subassembly.
E3.	Battery	—	Unscrew bottom cap. Remove battery.
E4.	Bottom Cap Spring	—	Remove insulator on spring. Unscrew spring.

** 60700, 60710, 60720 Reassembly **

E5.	Bottom Cap Spring	—	Screw in replacement spring. Assemble insulator on top of the spring.
E6.	Top Cap Sleeve	—	Assemble top cap sleeve onto handle tube sub assembly.
E7.	Hook-on Neck	—	Assemble hook-on neck sub-assy onto top cap sleeve and tighten. Insert set screw and tighten.
E8.	Battery	—	Insert rechargeable battery into handle tube subssembly. Assemble bottom cap and tighten.

End 60700, 60710, 60720

F. 60713 Disassembly:

F1.	Battery	—	Unscrew bottom cap assembly. Remove rechargeable battery.
F2.	Plunger Guide	—	Unscrew contact retaining screw. Remove contact, spring, plunger. Unscrew plunger guide.
F3.	Cartridge Assembly	—	Press on lamp/cartridge assembly to remove it from handle assembly. If lamp falls out without having to press on it, then the retaining ring (‘o’ ring) may be missing or is dislodged. Replace it if missing or dislodged. (Since the 'o' ring sits in a groove, installation is difficult. Use tool T-9583 to install ‘o’ ring. Alternative method is to use a fat marking pen with light colored cap. Insert pen into handle with cap towards hook end. Insert ‘o’ ring into handle from the hook end. Use tweezers and bent paper clip to guide ‘o’ ring into groove). Do not disassemble cartridge. Bottom center contact is ultrasonic welded into insulator. Insulator is gluedt into case. Cartridge is not repairable.

60713 Disassembly Continued

F4.	Lamp	—	Remove switch plunger (resembles typical lamp hood) by unscrewing. Unscrew lamp.

** 60713 Reassembly **

F5.	Lamp	—	Install replacement lamp. Clean lamp. Install switch plunger.
F6.	Cartridge Assembly	—	Slide cartridge assembly into handle subassembly.
F7.	Plunger Guide	—	Screw plunger guide into bottom cap. Insert plunger, spring, contact and retaining screw. Tighten bottom contact retaining screw.
F8.	Battery	—	Insert rechargeable battery. Install bottom cap assembly and tighten.

End 60713

G. 60803 Disassembly:

G1.	Batteries	—	Unscrew bottom cap and remove 2 “C” batteries and inner tube assembly.
G2.	Spring	—	Unscrew spring in bottom cap.
G3.	Lamp	—	Unscrew lamp from inner tube assy.

** 60803 Reassembly **

G4.	Spring	—	Screw in replacement spring.
G5.	Lamp	—	Screw in replacement lamp and clean.
G6.	Batteries	—	Insert 2 “C” batteries into inner tube assembly and slide inner tube assembly into outer tube assembly. Install bottom cap and tighten.

End 60803

H. 60804 Disassembly:

H1.	Batteries	—	Unscrew bottom cap and remove 2 “AA” batteries and inner tube assembly.
H2.	Spring	—	Unscrew spring in bottom cap.
H3.	Lamp	—	Unscrew lamp from inner tube assy.

** 60804 Reassembly **

H4.	Spring	—	Screw in replacement spring.
H5.	Lamp	—	Screw in replacement lamp and clean.
H6.	Batteries	—	Insert 2 “AA” batteries into inner tube assembly and slide inner tube assembly into outer tube assembly. Install bottom cap and tighten.

End 60804

I. 60813, 60814 Disassembly:

I1.	Batteries	—	Unscrew bottom cap assembly. Remove 2 alkaline batteries.
I2.	Bottom Cap Spring	—	Unscrew spring from bottom cap.
I3.	Cartridge Assembly	—	Press on lamp/cartridge assembly to remove it from handle assembly. If lamp falls out without having to press on it, then the retaining ring (‘o’ ring) may be missing or is dislodged. Replace it if missing or dislodged. (Since the 'o' ring sits in a groove, installation is difficult. Use tool T-9583 to install ‘o’ ring. Alternative method is to use a fat marking pen with light colored cap. Insert pen into handle with cap towards hook end. Insert ‘o’ ring into handle from the hook end. Use tweezers and bent paper clip to guide ‘o’ring into groove). Do not disassemble cartridge. Bottom center contact is ultrasonic welded into insulator. Insulator is glued into case. Replace if defective.

60813, 60814 Disassembly Continued

I4.	Lamp	—	Remove switch plunger (resembles typical lamp hood) by unscrewing. Unscrew lamp.

** 60813, 60814 Reassembly **

I5.	Lamp	—	Install replacement lamp. Clean lamp. Install switch plunger.
I6.	Cartridge Assembly	—	Slide cartridge assembly into handle subassembly.
I7.	Bottom Cap Spring	—	Screw spring into bottom cap.
I8.	Batteries	—	Insert 2 alkaline batteries. Install bottom cap assembly and tighten.

End 60813, 60814

J. 60815 Disassembly:

J1.	Bottom Cap Spring	—	Unscrew bottom cap. Remove insulator on spring. Unscrew spring.
J2.	Batteries	—	Remove battery pack assembly. Remove 2 AA alkaline batteries.
J3.	Cartridge Assembly	—	Press on lamp/cartridge assembly to remove it from handle assembly. If lamp falls out without having to press on it, then the retaining ring (‘o’ ring) may be missing or is dislodged. Replace it if missing or dislodged. (Since the ‘o' ring sits in a groove, installation is difficult. Use tool T-9583 to install ‘o’ ring. Alternative method is to use a fat marking pen with light colored cap. Insert pen into handle with cap towards hook end. Insert ‘o’ ring into handle from the hook end. Use tweezers and bent paper clip to guide ‘o’ ring into groove). Do not disassemble cartridge. Bottom center contact is ultrasonic welded into insulator. Insulator is glued into case. Replace if defective.

60815 Disassembly Continued

J4.	Lamp	—	Remove switch plunger (resembles typical lamp hood) by unscrewing. Unscrew lamp.

** 60815 Reassembly **

J5.	Lamp	—	Install replacement lamp. Clean lamp. Install switch plunger.
J6.	Cartridge Assembly	—	Slide cartridge assembly into handle subassembly.
J7.	Bottom Cap Spring	—	Screw in replacement spring. Assemble insulator on top of the spring.
J8.	Batteries	—	Insert 2 “AA” cell batteries into battery pack assembly. Insert battery pack into handle assembly in the direction of the arrow. Assemble bottom cap and tighten.

End 60815

Laryngoscope Handles

TOOLS/MATERIALS/SUPPLIES

Retaining “O” Ring Insertion Tool (Welch Allyn T-9583)
Insulator Assembly Driver (For 60400) (Welch Allyn T- 11912)
Pin Vise “A” Size (L.S. Starrett Model 166 A) for .028" Key
Pin Vise “D” Size (L.S.Starrett Co.166D) for T-11895-2 above
Pin Vise “C” Size (L.S.Starrett Co.166C) for Drills/Taps
Tweezers (Stainless Steel) Offset 4 1/4" Long (Model A-5ASA)**
Tweezers (Grobet Peer #7 Stainless Steel)
12"X 12" (approximately) Foam Pad (Mouse Mat™ , American Covers Inc.)
Jewelers Screwdriver With 1/16" Flat Blade
Flat Blade Screwdriver ie. Xcelite # P-181
Needle Nose Pliers ie. Xcelite # 52cg 152mm
Needle Point Awl

TAP/DRILL/KEY:	TAP	DRILL	KEY
	0-80	3/64"(.0469)	.028"
	2-56	#50 (.0700")	.035"
	3-48	#47 (.0785")	.050"
	4-40	#43 (.0890")	.050"

Section 12

ILLUMINATOR

MODEL #	PAGE
60500	1-2

ILLUMINATOR

Special Instructions:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog.

60500 Disassembly:

1.	Batteries	—	Unscrew switch housing assembly. Remove 2 “AA” alkaline batteries.
2.	Lamp	—	Unscrew nose assembly. Push lamp out of head.
3.	Contact Strip	—	Grab end of contact strip and rotate it as you pull it up and out of the nose. Remove contact strip carefully with tweezers.
4.	Contact Button	—	Unscrew plastic retaining nut. Remove: Long cup contact, contact spring, short cup contact. Sleeve will fall out if contact housing is tapped on table. Remove sleeve. Unscrew contact screw (8-32 socket head cap screw is glued during manufacture) (use 9/64" hex key), and remove contact button with attached plunger spring.

** 60500 Reassembly **

5.	Contact Button	—	Attach plunger spring to contact button and insert button into top of contact housing. Secure the 8-32 contact screw with Locktite 222. Tighten with 9/64" hex key. Position the sleeve with the flatted end towards the contact button. Insert sleeve with the “flat “ facing the set screw. Assemble these items over the sleeve: short cup contact, contact spring, and long cup contact. Secure these parts by screwing in the plastic retaining nut.
6.	Contact Strip	—	Insert the contact strip into the nose assembly with the prongs facing away from the threaded end.

7.	Lamp	—	Clean the lamp and insert into the nose assembly. Assemble nose assembly to handle tube.
8.	Batteries	—	Insert 2 “AA” size alkaline batteries (+ end towards lamp-end of illuminator) and assemble switch housing assembly to handle tube. Clean lamp. Test.

End 60500 reassembly

TOOLS/MATERIALS/SUPPLIES

9/64" Hex Key
Tweezers (Stainless Steel or Plastic, must be Non-Magnetic, Grobet Peer # 7)
12"X 12" (Approximately) Foam Pad (Mouse Mat™ American Covers Inc.)
Needle Nose Pliers

Section 13

LARYNGOSCOPE BLADES

MODEL #	PAGE	MODEL #	PAGE
68040	1-2	69242	1-2
68041	1-2	69243	1-2
68042	1-2	69244	1-2
68043	1-2	69601	1-2
68044	1-2	69602	1-2
68045	1-2	69603	1-2
68060	1-2	69604	1-2
68061	1-2	69613	1-2
68062	1-2	69041	1-2
68063	1-2	69042	1-2
68064	1-2	69043	1-2
68065	1-2	69044	1-2
68470	1-2	68040	1-2
68600	1-2	68041	1-2
68601	1-2	68042	1-2
68602	1-2	68043	1-2
68603	1-2	68044	1-2
68604	1-2	63470	1-2
69041	1-2	63471	1-2
69042	1-2	63482	1-2
69043	1-2	63483	1-2
69044	1-2	63484	1-2
69061	1-2	66471	1-2
69062	1-2	66482	1-2
69063	1-2	66483	1-2
69064	1-2	66484	1-2
69211	1-2	67471	1-2
69212	1-2	67482	1-2
69213	1-2	67483	1-2
69214	1-2	67484	1-2
69241	1-2		

Instructions for Cleaning, Disinfecting and Sterilizing Laryngoscope Blades prior to Service Work

Reusable Laryngoscopes (Fiber Optic and Standard)

634, 664, 674, 680, 690, 692 series Reusable Laryngoscopes

I. CLEANING

- Do not use ultrasonic cleaning.
- Lamp type - leave lamps in
- Convertible or fiber optic type, remove light pipes. Clean all surfaces with mild detergent and warm water solution, or enzymatic cleaner. Reassemble.

II. DISINFECTION (Minimum-High Level)

- Lamp type, leave lamp in.
- Blades and light pipes may be soaked in a 14 day (2.4-2.6%) glutaraldehyde solution following solution manufacturer's instructions for exposure time and temperature for high level disinfection.
- Do not soak in sodium hypochlorite (bleach) or hydrogen peroxide solutions.

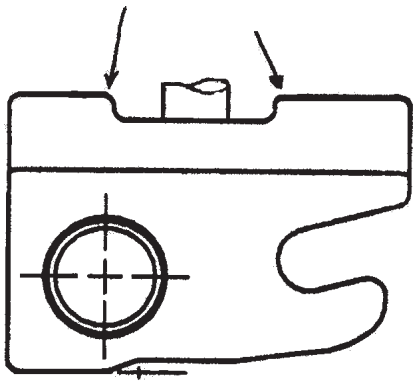
III. STERILIZATION

- Lamp type - leave lamps in
- Do not flash autoclave
- Blades and light pipes will withstand any standard autoclave cycle (pre-vac or gravity) not exceeding 280^{O}F (138^{O}C). Always wrap laryngoscopes.
- Soak in 14 day (2.4-2.6%) glutaraldehyde solution. Follow manufacturer's instructions for time and temperature for sterilization.
- Steris™ System I
- Ethylene oxide sterilization: ETO concentrations of 10% to 100%, do not exceed 132^{O}F (55^{O}C) exposure time 2-4 hours depending on gas mixtures. Aeration 12-16 hours at 120^{O}F (49^{O}C)

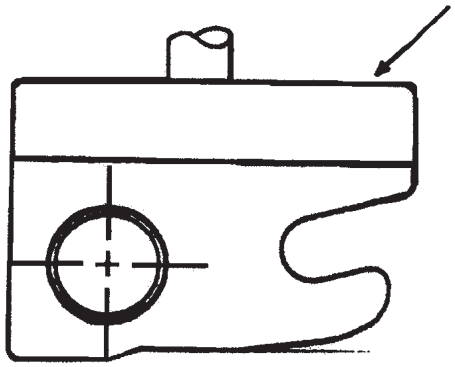
- Sterrad™ Hydrogen Peroxide Plasma System

1) Standard (Lamp Type) Blades:
All Welch Allyn Standard blades and light pipes Sterrad compatible

2) Fiber Optic Blades:
All blades are Sterrad compatible. However, only the light pipes with the recessed area where the light pipe exits the top of the green plastic base are compatible. (See sketch on next page). These may also be identified by the laser markings for the model number and size (in black) on the rear of the base. The original, non-compatible bases had the markings molded into them and the entire top of the base was at one level.



COMPATIBLE



NOT COMPATIBLE

Inspection Instructions: (After Disinfection)

- •Inspect for any obvious defects or missing component(s).
- •Temporarily install component(s) to make the blade functional.
- •Attach the blade onto a fully charged battery handle.
- •Verify that the blade and the handle fit together securely and that illumination is not interrupted with mechanical shock or manipulation of the attached blade.

Fiber Optic blade inspection/repair items:

- •Replace blade or light pipe as necessary to produce firm fit handle.
- •Inspect light spot as projected onto target (included in this manual) for location and intensity. Replace light pipe if spot location is not centered on target, or if light pipe transmission is unacceptable.
- •Replace detent screw assembly blade as required if screw will not engage blade securely.
- •Replace screw if it will not engage in test handle.

Lamp Type blade inspection/repair items:

- •Repace blade of light pipe as necessary to produce firm fit in handle.
- •If lamp does not light, replace lamp.
- •If lamp still does not light, replace light pipe.
- •If lamp does not fit properly into light pipe, replace light pipe assembly.
- •Replace detent screw or blade as required if screw will not engage blade properly.
- •Replace detent screw if it will not engage handle properly.

Disassembly/Reassembly

A Blade Disassembly:

1. Remove Light carrier
   Remove locking screw assembly by rotating counter clockwise. (use flat-blade screwdriver)
   Pull light carrier away from base of laryngoscope.
   Slide distal end of carrier out of blade.

2. Remove Lamp (For conventional and convertible blades)
   Unscrew lamp counter clockwise.

B Blade Reassembly:

3. Install Lamp — Insert replacement lamp and tighten clockwise.

4. Install Light carrier
   Position light carrier in place.
   Insert locking screw and tighten with flat blade screwdriver.

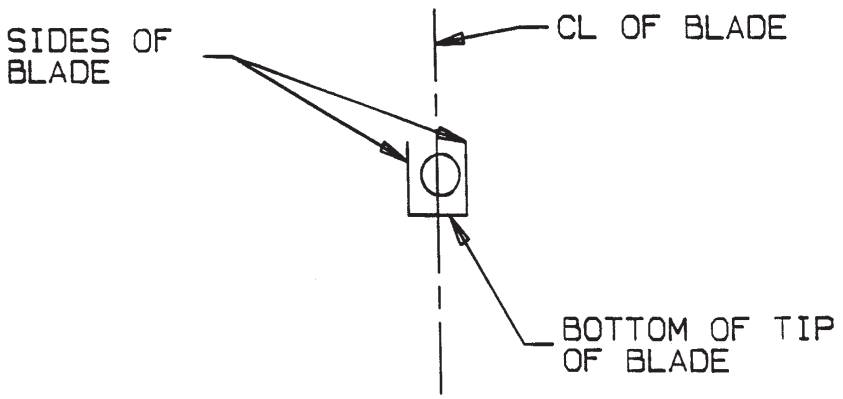
5. Test — Perform inspections as listed on page one and two of this manual. Hold illuminated laryngoscope blade tip so it touches the appropriate target. Compare the projected light spot against the corresponding sample target included with this manual. The center of the light spot should be centered on the target circle when the end of the blade is aligned on the target.

Listing of Targets included with this Service Manual

Type:	Target 'T' NUMBER
EMAC 1	T11914
EMAC 2	T11915
EMAC 3	T11916
EMAC 4	T11917
MAC 1	T11918
MAC 2	T11919
MAC 3	T11920
MAC 4	T11921
MILLER 0, 00	T11922A
MILLER 1	T11923
MILLER 2	T11924
MILLER 3	T11925
MILLER 4	T11926

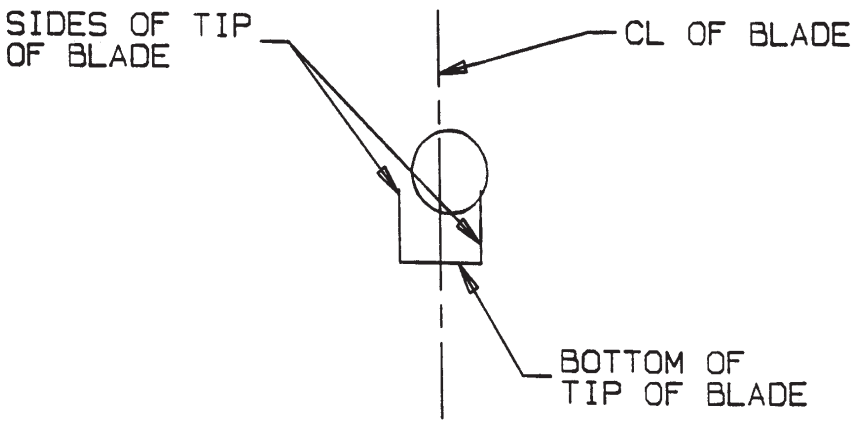
Tools

Small flat-blade screwdriver



EMAC 1
T11914

1/4/93
JAN
JAN\EMAC\EMAC



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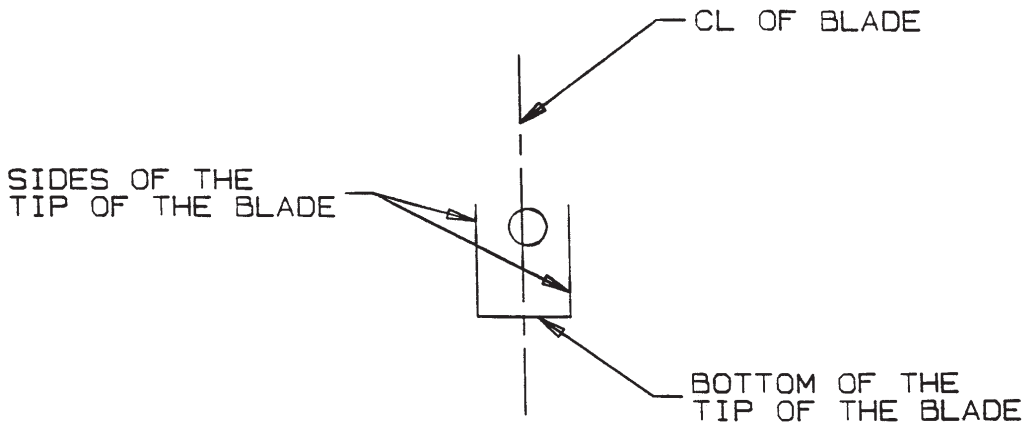

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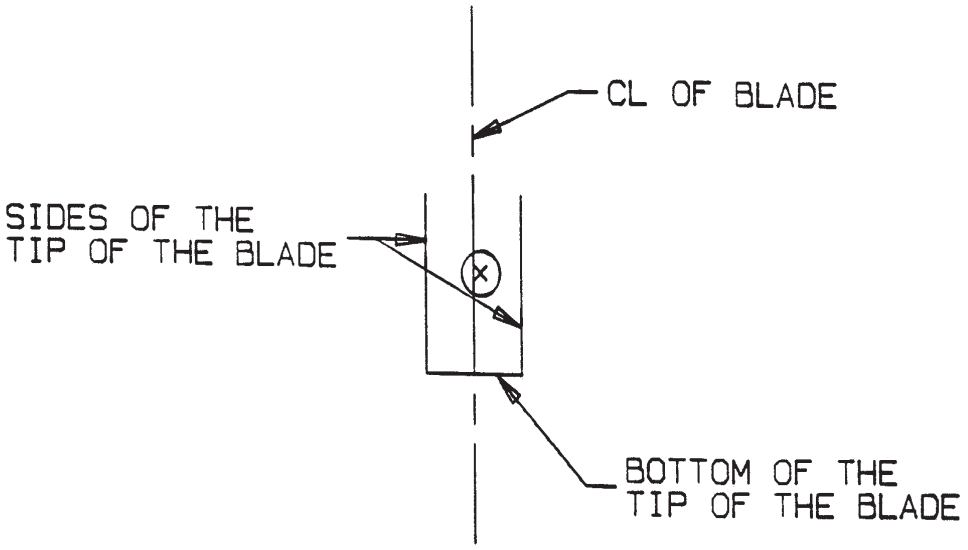

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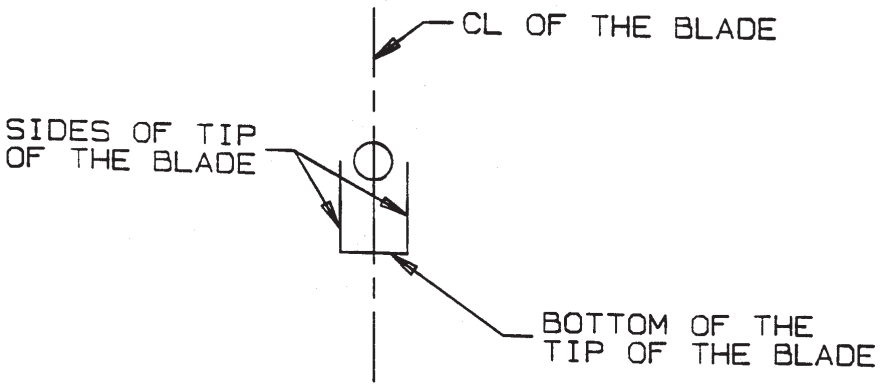

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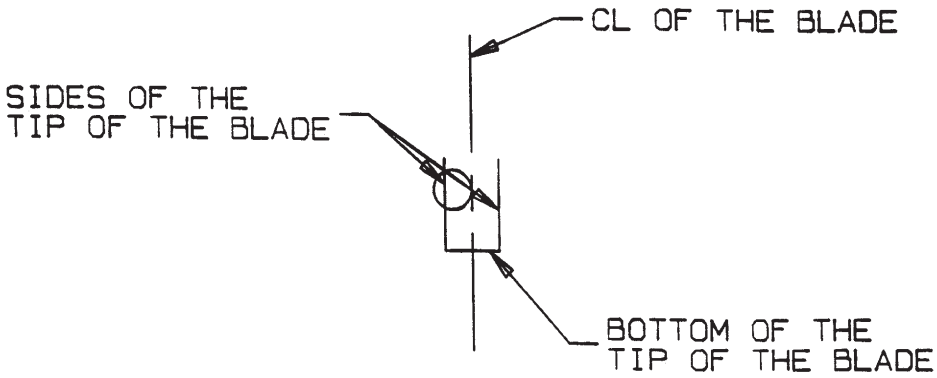

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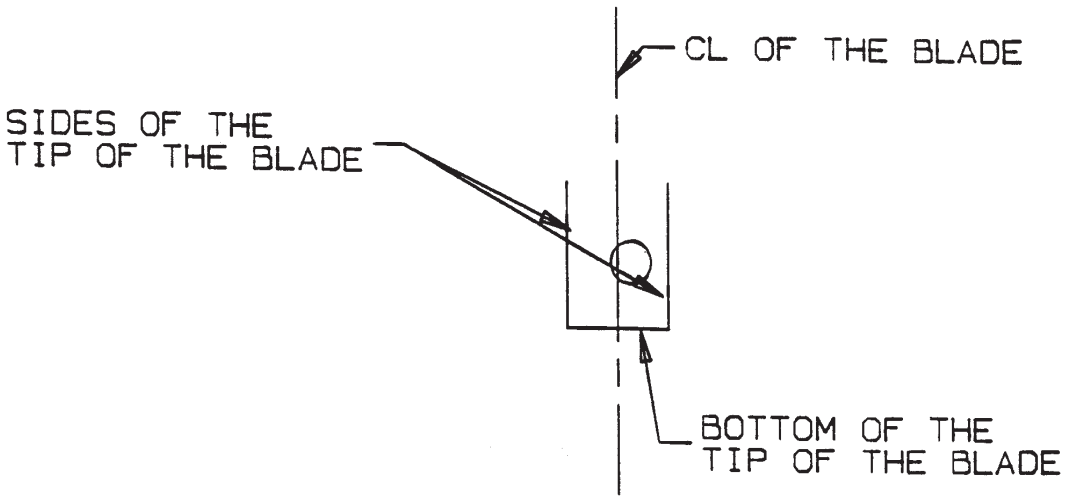

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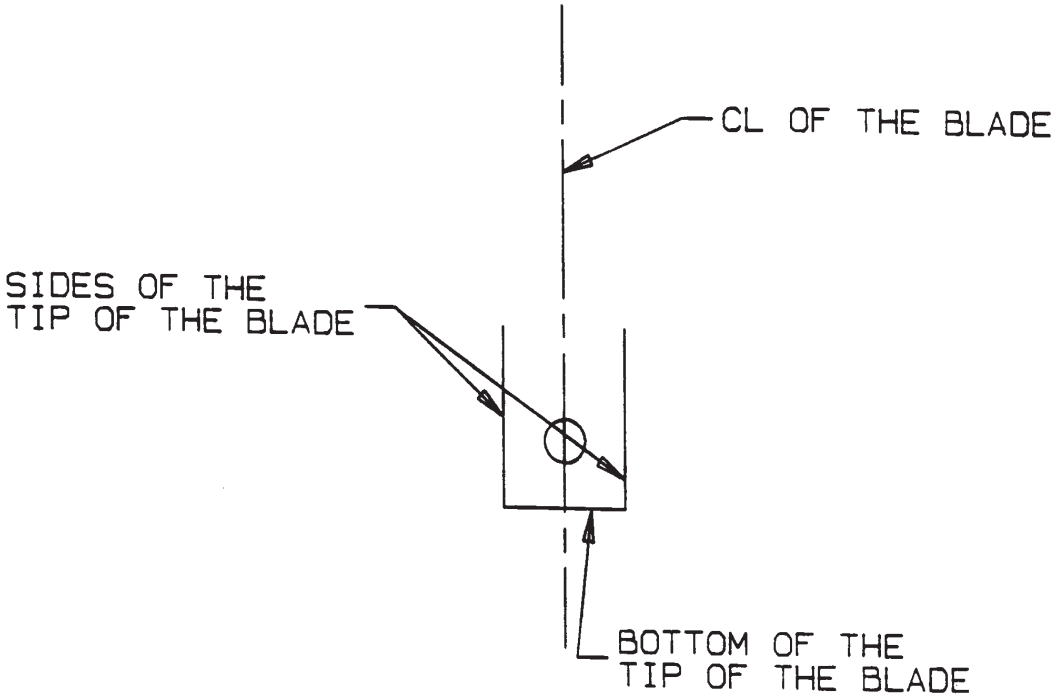

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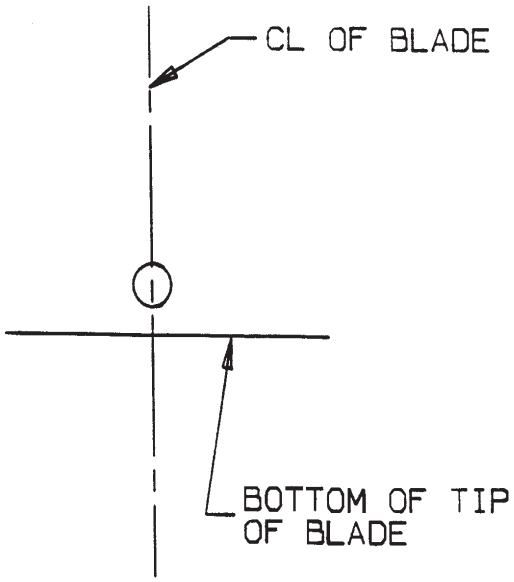

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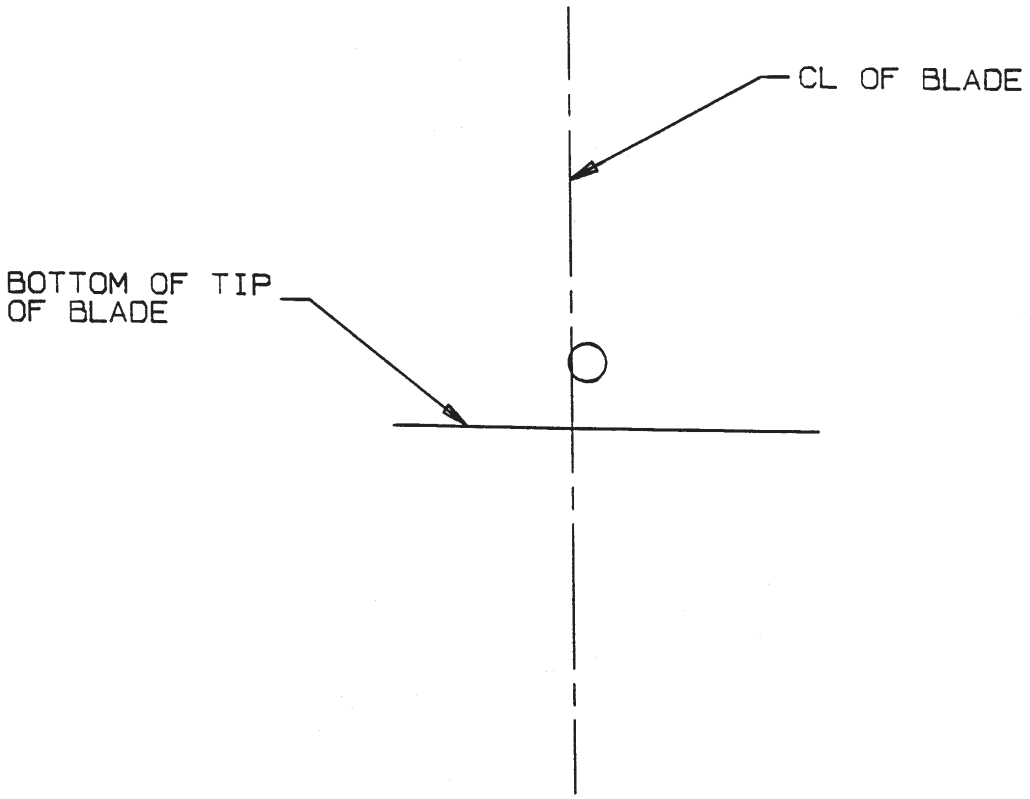

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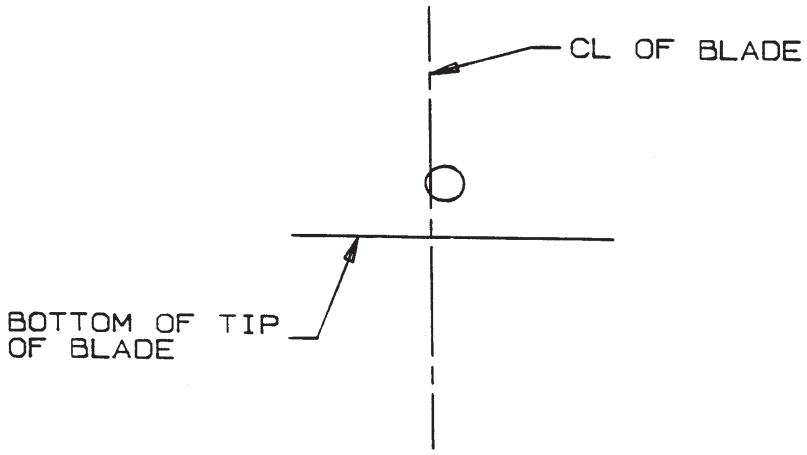

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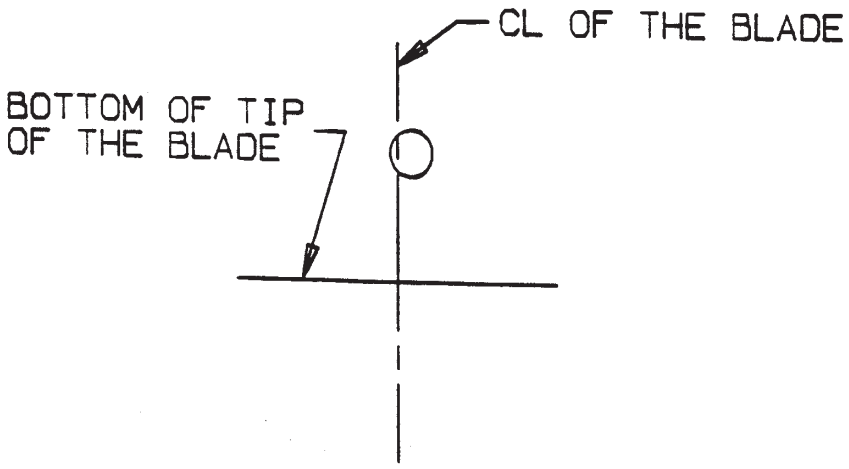

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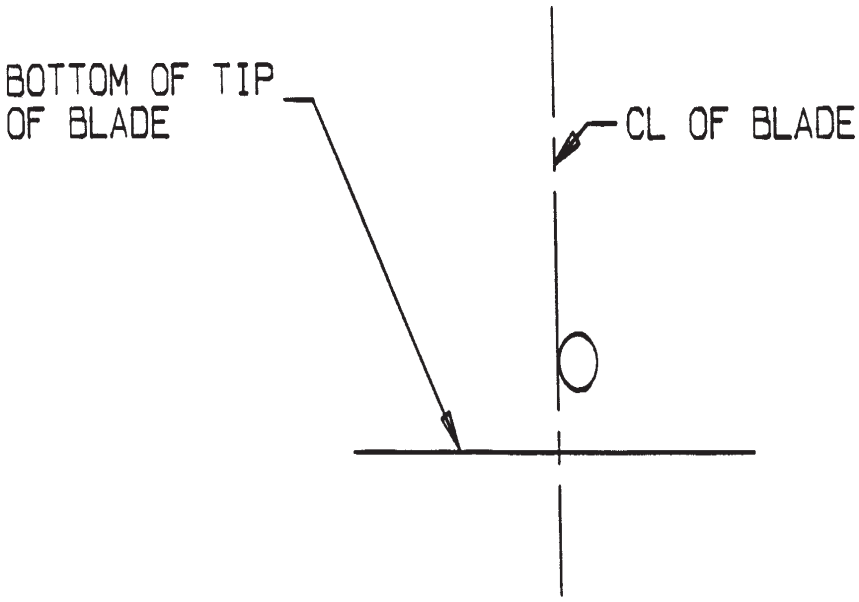

MILLER 4
T11926

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Section 14

BATTERY HANDLES

MODEL #	SUB-SECTION	PAGE
70000	A	1
70100	A	1
70500	A	1
70110	B	2
70150	C	2
70160	C	2
70700	D	3
70720	D	3
71000	D	3
71000-C	D	3
71020-C	D	3
71020 IEC	D	3
71500	E	4
71670	E	4
72801	F	5

BATTERY HANDLES

Special Instructions:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog 900299.

Battery Handles- 70000, 70100, 70110, 70150, 70160, 70500, 70700, 70720, 71000, 71000-C, 71020-C, 71020 IEC, 71500, 71670, 72801

A. 70000, 70500 Disassembly:

A1.	Batteries	—	Unscrew bottom cap. Remove 2 batteries.
A2.	Top Cap Assembly	—	Unscrew 2-56 set screw. (Use .035 key) remove top cap.
A3.	Bottom Cap Spring	—	Unscrew bottom cap. Unscrew spring.

** 70000, 70500 Reassembly **

A4.	Bottom Cap Spring	__	Screw in replacement spring.
A5.	Top Cap Assembly	—	Assemble top cap assembly to handle tube. Screw top cap on until the set screw hole in the top cap aligns with the Hole in the handle tube. Install 2-56 set screw. Screw set screw into handle tube until it is flush or slightly below the surface of the top cap. If a replacement handle tube is being installed, mark and drill clearance hole in the handle tube to receive the set screw during reassembly.
A6.	Batteries	—	Insert 2 batteries, (+ end in first). Assemble bottom cap and tighten. Test.

End 70000, 70500

B. 70100, 70110 Disassembly:

B1.	Batteries	—	Unscrew bottom cap assembly. Remove rechargeable battery.
B2.	Pocket Clip	—	Unscrew lock nut. (Use spanner T-3219) hold rheostat knob securely in place and remove pocket clip.

** 70100, 70110 Reassembly **

B3.	Pocket Clip	—	While still holding rheostat knob, install replacement pocket clip. Install lock nut (with ridge facing clip)and tighten lock nut.
B4.	Battery	—	Insert rechargeable battery with the spring clip in first to prevent spring from breaking. Assemble bottom cap assembly and tighten.
			Test.

End 70100, 70110

C. 70150, 70160 Disassembly:

C1.	Batteries	—	Unscrew handle assembly. Remove 2 alkaline AA batteries.
C2.	Pocket Clip	—	Unscrew lock nut. (Use spanner T-3219) hold switch knob securely in place and remove pocket clip.

** 70150, 70160 Reassembly **

C3.	Pocket Clip	—	While still holding switch knob, install replacement pocket clip. Install lock nut (with ridge facing clip) and tighten lock nut.
C4.	Batteries	—	Insert 2 AA alkaline batteries into handle assembly. Screw handle and handle top connector together.
			Test.

End 70150, 70160

D. 70700, (70720 IEC) 2.5V Rechargeable Handle Disassembly:
71000, 71000-C, 3.5V Rechargeable Handle Disassembly:
71020-IEC, 71020-C 3.5V Rechargeable Handle Disassembly:

D1.	Battery	—	Unscrew bottom cap from handle tube assembly. Remove battery.
D2.	Top Cap Assembly	—	Unscrew handle sub assembly from handle tube assembly. Unscrew 2-56 set screw. (Use .035" key). Remove top cap from top cap sleeve.
D3.	Bottom Cap Spring	—	Unscrew bottom cap. Unscrew spring. Remove bottom cap insulator from spring.

** 70700, 70720, 71000, 71000-C, 71020 IEC, 71020-C Reassembly **

D4.	Bottom Cap Spring	—	Screw in replacement spring. Install bottom cap insulator (except on 71000-C).
D5.	Top Cap Assembly	—	Assemble top cap assembly to top cap sleeve. Screw top cap on until the set screw hole in the top cap aligns with the hole in the top cap sleeve. Install 2-56 set screw. Screw set screw into top cap sleeve until it is flush or slightly below the surface of t he top cap. If a replacement top cap sleeve is being installed, mark and drill clearance hole in the top cap sleeve to receive the set screw during reassembly.
D6.	Batteries	—	Insert 2 batteries, (+ end in first). Assemble bottom cap and tighten.
			Test.

End 70700, 70720, 71000, 71000-C,
71020 IEC, 71020-C

E. 71500 2.5V, 71670 3.5V Rechargeable Handle Disassembly:

E1.	Battery	—	Unscrew bottom cap assembly. Remove rechargeable battery.
E2.	Top Cap Assembly	—	Unscrew 2-56 set screw. (Use .035" key). Remove top cap from handle tube.
E3. a)	Bottom Cap Insulator (Pre April 1999)	—	Unscrew hollow screw. Remove button contact, contact spring, contact plunger. Unscrew bottom cap insulator.
b)	Bottom Cap Insulator with Diode (April 1999 and later)	__	Unscrew bottom cap insulator and remove contact plunger, contact spring, button contact, diode.

71500, 71670 Reassembly

E4	Top Cap Assembly	__	Screw top cap assembly onto handle tube. Screw top cap on until the set screw hole in the top cap aligns with the hole in the handle tube. Install 2-56 set screw. Screw set screw into handle tube until it is flush or slightly below the surface of the top cap. If a replacement handle tube is being installed, mark and drill clearance hole in the handle tube to receive the set screw during reassembly.

E5. a)Bottom Cap Insulator __ Screw bottom cap insulator into bottom cap. Insert contact plunger, contact spring, button contact. Screw hollow screw into bottom cap to secure above items . Tighten.

b)Bottom Cap Insulator with Diode __ Assemble as per Figure 1 below.

Test the bottom cap assembly with a Digital Volt Ohm Meter as per Figure 2 below:

Figure 1:
Bottom Cap Assembly
with diode

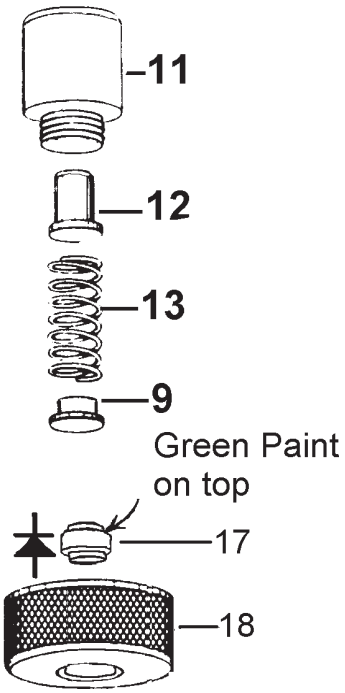
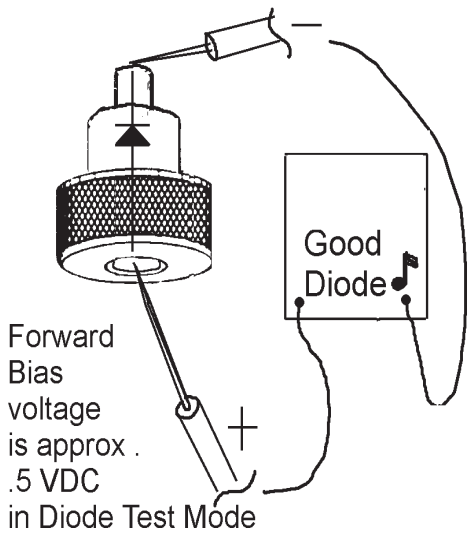


Figure 2: Diode Test
with Digital Multimeter



E6. Battery — Insert rechargeable battery. (Put 'clip' end in first to avoid damage to clip). Install bottom cap assembly and tighten.

End 71500, 71670

F. 72801 2.5V Pocket Set Handle Disassembly:

F1. Battery — Unscrew bottom cap assembly. Remove rechargeable battery or 2 ‘AA' batteries.

** 72801 Reassembly **

F2. Battery — Insert rechargeable battery with the spring clip in first to prevent spring from breaking or insert 2 ‘AA’ batteries. Assemble bottom cap assembly and tighten. Test.

END 72801

TOOLS/MATERIALS/SUPPLIES

Digital Volt Ohm Meter with Diode Checking Function

Spanner For 70100 (Welch Allyn T-3291)

Pin Vise “C” Size (L.S.Starrett Co.166C) For Drills/Taps

12"X 12" (Approximately) Foam Pad (Mouse Mat™ American Covers Inc.)

Flat Blade Screwdriver ie. Xcelite # P-181

TAP/DRILL/KEY:	TAP	DRILL	KEY
	2-56	#50 (.0700")	.035"
	3-48	#47 (.0785")	.050"
	4-40	#43 (.0890)	.050"

Section 15

LIGHT HANDLES

MODEL #	SUB-SECTION	PAGE
73200	A	1
73210	B	2
73305	B	2
78000	C	2

LIGHT HANDLES

Special Instructions:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog PN 900299.

Light Handles - 73200, 73210 With 73305 Transformer, 78000

A. 73200 Disassembly:

A1.	Halogen Lamp	—	Unplug light handle from power source. Loosen 2-56 x 1/8" long set screw from bottom of handle top assembly. (Use .035"key) unscrew handle top assembly and remove from light carrier subassembly. Unscrew lamp.
A2.	Cord Assembly	—	Loosen 2-56 x 3/16" set screw unscrew 'adapter-handle-to-spring'. Pull cord to disconnect pin connectors of old cord from light carrier.

** 73200 Reassembly **

A3.	Cord Assembly	—	Pass replacement cord through adapter handle to spring and push mini spade and pin connectors onto pin locations at bottom of light carrier assembly. Screw 'adapter-handle-to-spring' onto bottom of light carrier. Crimp brass strain relief onto cord where it exits bottom of 'adapter'. Screw strain relief spring assembly onto 'adapter'. Tighten 2-56 x 3/16 " long set screw at bottom of light carrier assembly.
A4.	Halogen Lamp	—	Screw replacement lamp into light carrier. Clean lamp. Screw handle top assembly onto light carrier and secure by tightening 2-56 x 1/8" long set screw. Connect to power source and test.

End 73200

B. 73210 Light Handle, 73305 Transformer Disassembly:

B1.	Halogen Lamp	—	Unplug transformer from power source. Unplug light handle cord from transformer cord plug. Unscrew handle assembly. Unscrew lamp.

** 73210 Reassembly **

B2.	Halogen Lamp	—	Screw replacement lamp into lamp holder and cord assembly. Clean lamp. Screw handle assembly onto lamp holder. Connect to power source and test.

End 73210

C. 78000 Light Handle

C1.	Lamp	—	Unscrew lamp from molded cord assembly.

** 78000 Reassembly **

C2.	Lamp	—	Screw replacement lamp into molded cord assembly. Clean lamp. Connect to power source and test.

End 78000

LIGHT HANDLES

TOOLS/MATERIALS/SUPPLIES

Pin Vise “C” Size (L.S.Starrett Co.166C) for Drills/Taps
Tweezers (Stainless Steel) Offset 4 1/4" Long (Model A-5ASA)**
Tweezers (Grobet Peer #7 Stainless Steel)
12"X 12" (Approximately) Foam Pad (Mouse Mat™ American Covers Inc.)
Needle Nose Pliers ie. Xcelite # 52cg 152mm
Needle Point Awl

TAP/DRILL/KEY:	TAP	DRILL	KEY
	2-56	#50 (.0700")	.035"
	3-48	#47 (.0785")	.050"

Section16

PEN LIGHTS
POCKET LIGHTS

MODEL #	SUB-SECTION	PAGE
76000	A	1-2
76600	B	2-3
77700	C	3-4
77800	D	5-6
77900	E	6-8

PEN LIGHTS
POCKET LIGHTS

SPECIAL INSTRUCTIONS:

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog PN 900299. The terms switch assembly, nose, head, and switch housing appear in the description of parts for these models. Check each model number's definition of each term since their use is inconsistent.

A. 76000 Penlight Disassembly:

A1.	Batteries	—	Unscrew nose assembly. Remove 2 "AAA" alkaline batteries.
A2.	Lamp	—	Push lamp out of nose assembly.
A3.	Contact Strip	—	Grab end of contact strip and rotate it as you pull it up and out of the nose. Remove contact strip carefully with tweezers.
A4.	Spring Clip	—	Unscrew clip and head assembly as one unit. (Very early models had a small set screw securing the head onto the handle tube. Remove if present). Unscrew long cup retainer (use T11972 spanner or T11268 pliers). Remove: long cup retainer , cup contact-long , contact spring, cup contact-short, cup retainer, plunger spring, plunger contact with attached plunger contact spring. Slide spring clip out of head. If necessary, pull plunger contact spring out of plunger contact.

** 76000 Reassembly **

A5.	Spring clip	—	Attach plunger contact spring to plunger contact. Insert spring clip into head through slot and secure it there by inserting plunger contact into head and through the hole in the top of the spring clip. This will hold the spring clip in the head.

			Insert into head: plunger spring, cup retainer with raised ring facing plunger spring just inserted. Assemble long cup retainer by holding it with the 2 small holes facing down. Insert the cup contact-long, contact spring, and cup contact-short. Assemble the head assembly by lowering it down over the long cup retainer assembly. Secure by screwing long cup retainer up into the head assembly. Do not turn it over until the long cup retainer is screwed in sufficiently to engage the small cup into the cup retainer. Otherwise, it will fall off of the spring, adding time to the repair.
A6.	Head Assembly	—	Screw the head assembly onto the ribbed end of the handle tube.
A7.	Contact Strip	—	Insert the contact strip into the nose assembly with the prongs facing away from the threaded end.
A8.	Lamp	—	Clean the lamp and insert into the nose assembly.
A9.	Batteries	—	Insert 2 “AAA” size alkaline batteries into the handle tube. (+ Facing lamp- end of penlight). Screw the nose assembly to the handle tube. Clean the tip of the lamp. Test.

End 76000 Reassembly

B. 76600 Penlite Disassembly:

B1.	Batteries	—	Unscrew lamp from penlite. Remove 2 “AAA” alkaline batteries. (The lamp bulb is integral with the whole tip assembly).
B2.	Lamp	—	Unscrew lamp from penlite. The switch assembly is not repairable. Replace the switch/tube assembly if necessary.

** 76600 Reassembly **

B3.	Batteries	—	Insert 2 “AAA” batteries into the switch/tube assembly. (+ End facing lamp end).
B4.	Lamp	—	Screw new lamp onto switch/tube assembly. Clean lamp. Test.

End 76600 Reassembly

C. 77700 Pocketlight Disassembly:

C1.	Batteries	—	Unscrew nose assembly. Remove 2 “AA” alkaline batteries.
C2.	Lamp	—	Push lamp out of head assembly.
C3.	Contact Strip	—	Grab end of contact strip and rotate it as you pull it up and out of the head. Remove contact strip carefully with tweezers.
C4.	Spring Clip	—	Unscrew switch assembly from handle tube assembly. Unscrew retaining nut (use T11269 pliers) approximately 1/8" and remove spring clip from switch assembly.
C5.	Plunger Release	—	Remove: retaining nut, cup contact-long , contact spring, cup contact-short, sleeve. Clamp cap in small ‘V-block’ vise and unscrew contact screw. Remove contact screw with attached detent spring, buffer plate, cap, contact return spring, and plunger release. Remove detent spring from contact screw.

** 77700 Reassembly **

C6.	Retaining Nut	—	Insert buffer plate into switch housing. Insert plunger release into hole (fat end on the inside) from the inside of switch housing. (Use needle nose pliers).

Install replacement detent spring onto contact screw and insert in switch housing (with the open end of the spring located over the plunger release). Insert contact return spring into cap and insert through top of switch housing. Engage the threads of the cap onto the contact screw by turning contact screw. Tighten all the way and then unscrew 1/2 turn. Insert into switch housing: sleeve, (with raised ring facing contact screw just inserted). Assemble retaining nut by holding it with the 4 small holes facing down. Insert the cup contact long, contact spring, and cup contact short. Assemble the switch assembly by lowering it down over the retaining nut. Secure by screwing retaining nut up into the switch assembly. Do not turn it over until the retaining nut is screwed in sufficiently to engage the small cup into the sleeve. Otherwise, it will fall off of the spring, adding time to the repair.

C7.	Switch Assembly	—	Screw the switch assembly onto the blue end of the handle tube assembly.
C8.	Contact Strip	—	Insert the contact strip into head with the prongs facing away from the threaded end.
C9.	Lamp	—	Clean the lamp and insert into the head assembly.
C10.	Batteries	—	Insert 2 "AA" size alkaline batteries into the handle tube. (+ facing lamp end of Penlight). Screw the head assembly to the handle tube assembly. Clean lamp. Test.

END 77700 Reassembly

D. 77800 Pocketlight Disassembly:

D1.	Batteries	—	Unscrew focusing adaptor assembly. Remove 2 “AA” alkaline batteries.
D2.	Lamp	—	Lift lamp out of focusing adaptor assembly. Unscrew lamp holder from lamp.
D3.	Lens Holder Assembly	—	Pull lens holder assembly from nose piece.
D4.	Spring Clip	—	Unscrew switch assembly from handle tube assembly. Unscrew retaining nut (use T11269 pliers) approximately 1/8" and remove spring clip from switch assembly.
D5.	Plunger Release	—	Remove: retaining nut, cup contact-long, contact spring, cup contact-short, sleeve. Clamp cap in small ‘V-block’ vise and unscrew contact screw. Remove contact screw with attached detent spring, buffer plate, cap, contact return spring, and plunger release. Remove detent spring from contact screw.

** 77800 Reassembly **

D6.	Retaining Nut	—	Insert buffer plate into switch housing. Insert plunger release into hole (fat end on the inside) from the inside of switch housing. (Use needle nose pliers). Install replacement detent spring onto contact screw and insert in switch housing (with the open end of the spring located over the plunger release). Insert contact return spring into cap and insert through top of switch housing. Engage the threads of the cap onto the contact screw by turning contact screw. Tighten all the way and then unscrew 1/2 turn. Insert into switch housing: sleeve, (with raised ring facing contact screw just inserted). Assemble retaining nut by holding it with the 4 small holes facing down. Insert the cup contact long, contact spring, and cup contact short.

77800 Reassembly Continuued

			Assemble the switch assembly by lowering it down over the retaining nut. Secure by screwing retaining nut up into the switch assembly. Do not turn it over until the retaining nut is screwed in sufficiently to engage the small cup into the sleeve. Otherwise, it will fall off of the spring, adding time to the repair.
D7.	Switch Assembly	—	Screw the switch assembly onto the blue end of the handle tube assembly.
D8.	Lens Holder Assembly	—	Clean both sides of the lens and inside of the lens holder/ nose assembly. Insert the unthreaded end of the nose piece into the lens holder assembly.
D9.	Lamp	—	Clean the lamp and screw it into the lamp holder. (Position the rim of the lamp holder towards the lamp base). Insert the lamp/lamp holder into the end of the nose piece.
D10.	Batteries	—	Insert 2 “AA” size alkaline batteries into the handle tube. (+ facing lamp-end of penlight). Screw the focusing adapter assembly to the handle tube assembly. Test.

End 77800 Reassembly

E. 77900 Pocketlight Disassembly:

E1.	Batteries	—	Unscrew head assembly including lamp. Remove 2 “AA” alkaline batteries.
E2.	Lamp	—	Pull lamp hood off of lamp. Unscrew lamp.
E3.	Spring Clip	—	Unscrew switch assembly from handle tube assembly. Unscrew retaining nut (use T11269 pliers) approximately 1/8" and remove spring clip from switch assembly.

E4.	Plunger Release	—	Remove: retaining nut, cup contact-longs, contact spring, cup contact-short, sleeve. Clamp cap in small 'V-block' vise and unscrew contact screw. Remove contact screw with attached detent spring, buffer plate, cap, contact return spring, and plunger release. Remove detent spring from contact screw.

** 77900 Reassembly **

E5.	Retaining Nut	—	Insert buffer plate into switch housing. Insert plunger release into hole (fat end on the inside) from the inside of switch housing. (Use needle nose pliers). Install replacement detent spring onto contact screw and insert in switch housing (with the open end of the spring located over the plunger release). Insert contact return spring into cap and insert through top of switch housing. Engage the threads of the cap onto the contact screw by turning contact screw. Tighten all the way and then unscrew 1/2 turn. Insert into switch housing: sleeve, (with raised ring facing contact screw just inserted). Assemble retaining nut by holding it with the 4 small holes facing down. Insert the cup contact long, contact spring, and cup contact short. Assemble the switch assembly by lowering it down over the retaining nut. Secure by screwing retaining nut up into the switch assembly. Do not turn it over until the retaining nut is screwed in sufficiently to engage the small cup into the sleeve. Otherwise, it will fall off of the sping, adding time to the repair.
E6.	Switch Assembly	—	Screw the switch assembly onto the blue end of the handle tube assembly.

E7.	Lamp	—	Clean the lamp and screw it into the nose. Slide the lamp hood over the lamp. It must fit tightly to prevent it from accidently falling off.
E8.	Batteries	—	Insert 2 “AA” size alkaline batteries into the handle tube. (+ facing lamp-end of penlight). Screw the head assembly to the handle tube assembly. Clean lamp. Test.

End 77900 Reassembly

TOOLS/MATERIALS/SUPPLIES

Tweezers (Stainless Steel or Plastic, Must Be Non-Magnetic, Grobet Peer # 7)

12"X 12" (Approximately) Foam Pad (Mouse Mat™ American Covers Inc.)

Long Nose Pliers

Spanner For 76000
Long Cup Retainer (Welch Allyn T11972)

Pliers For 77700, 77800, 77900
Retaining Nut (Welch Allyn T11269)

This manual is now part of the Traditional Instruments Service Manual

Service Manuals
Lighting

Section 17

Binocular Indirect Ophthalmoscope

B. I. O. Model 12000

Model#	Model Name	Section	Page
12000	B.I.O.	1	3-7
74101	Battery Pack	2	8
74141	B.I.O. Wall Bracket	3	9-10
All	Required Tools	4	11
All	Figures 1.7, 1.10 A&B	5	12-13

Special Instructions for B.I.O. Service

Clean all returned items by wiping with a solution of 10% Clorox/90% water. Do not use alcohol or other chemicals to clean to B.I.O. Inspect the unit, especially alignment prior to disassembly. Duplicate (if possible) customer problem.

Important: Check alignment before and after service.

1. Put B.I.O. on head.

2. Look at object held in hand, arms length. If the image appears as a double image, then the unit is misaligned. The B.I.O. unit must be evaluated on laser alignment equipment at Welch Allyn. Return to Technical Service Dept. for evaluation and or repair. Therefore, proceed with repairs only on units with good alignment.

Disassembly of Model 12000 B.I.O.

Refer to Figure 120103 in Repair Parts Catalog

Abbreviations used in text and parts list:

- ***CM*** Central Mirror
- ***EM*** Eye Mirror
- ***CMH*** Central Mirror Holder
- ***IM*** Illumination Mirror
- ***VS*** Viewing System
- ***IS*** Illumination System
- ***BIS*** B.I.O. Sub-Assembly without headband

Caution!!! Lamp area will be hot after use.

1.1 Lamp

Remove lamp cover.
Loosen the adjustment knob and slide the BIO all the way up.
Remove the lamp from its well.
Replace with new Welch Allyn lamp.
Clean new lamp with alcohol.
Insert lamp pin with slot (pin down).
Slide lamp cover over lamp.
Verify operation of the new lamp.

1.2 *VS* Housing Assembly

Unscrew and remove bracket knob.
Support the *BIS* and remove bracket screw, bracket spacer with washer.
Remove *BIS* from headband.
Remove lamp as per Step 1.1 above.
Rremove left and right outer insulators and left/right inner ear insulators respectively.
Remove top two screws.
Pull back cover off.
Remove cable connector assembly.
Loosen bottom two screws.
Pry off and discard -+- button.
Remove two outer bottom screws.
Loosen two central screws 3 turns.
Do not remove them. This helps *VS* housing removal.
Remove the *VS* housing form the *VS/IS* assemblies.

1.3	Illumination System *(IS)* Sub-Assembly	Place BIO in fixture T-12198 to ease further disassembly. Remove the two central screws that were loosened in the previous step. Seperate the illumination system sub-assembly from the visual assembly.
1.4	*IM* Yoke *IM* Mirror	Remove hair spring with tweezers. Remove *IM* yoke and IM mirror/mirror holder sub-assembly for illumination system bracket.
1.5	Illumination Lenses	When the two hex cap screws are removed from the illumination sub-assembly, it will come apart. Hold the illumination sub-assembly on a foam mat in a horizontal position for complete disassembly. Remove two hex cap screws from heat sink lamp holder. Use 3/32 hex key. Pull Illumination system bracket away from optics carrier. Remove compression spring and mirror tilt control. Remove aperture spacer assembly which contains aperture and filter holders. Remove heat sink lamp holder from contact holder. Remove spring washer, wide band hot mirror disc lens, lens spacer and lens.
1.6	VS Assembly	Remove and discard rubber eye cups. Remove and clean both eyepiece lenses.

.

End of Disassembly

Reassembly of Model 12000
Refer to Figure 120103 in Repair Parts Catalog

Important: Check alignment prior to reassembly of whole unit.

1.7 Aperture Filter Assy's

Clean the aperture and filter assemblies before installing in aperture spacers.
Place the aperture spacers side by side as in Figure 1.7.
Top spacer is put on left. Bottom spacer is put on right.
Place a spring waher in the right circle recess of each aperture spacer as shown in Figure 1.7.
Place aperture assembly, with the black aperture mask facing up, into the left (top) aperture spacer, on top of the washer.
Engage the detent with the aperture assembly.
Carefully pick up left (top) aperture spacer and turn it over.
Lay it on top of the other aperture spacer.
Hold the aperture spacers together with one hand and operate the levers of the aperture and filter assemblies.
Keep this orientation. After assembly, the filter lever must be on the right side.

1.8 Illumination System Bracket *IS* lenses

Clean the objective lens and all parts of illumination system.
Place the objective lens (convex down) into the *IS* bracket.
Place a lower aperture over the objective lens.
Press objective lens retainer into the *IS* bracket (over the lower aperture). Use tool T-12169.
Place *IM* yoke and mirror assembly together. Use new hair spring.
Place yoke and mirror assembly onto the *IS* bracket.
Place the *VS* subassembly into assembly nest T-12198.
Attach the IS bracket assembly to the *VS* subassembly with two chassis screws.
Place mirror tilt control in hole in *IS* bracket.
Insert compression spring into hole in mirror tilt control.
Place the aperture assembly built in Step 1.7 into assembly nest T-12196 (aperture side up)

■ Note: If assembled correctly, the filter lever will be on the right side of the aperture assembly.

Place a clean lens on top of aperture spacer (round side up).

Reassembly of Model 12000 cont'd

1.9	Optics Carrier ***IS*** lenses and components	Place optics carrier (ears up), over lens of aperture spacer assembly (lower lens.) Place lens spacer into optics carrier, over lower lens. Place upper lens (round side down) on top of lens spacer. Place hot mirror disc on top of lens. Place wide band hot mirror (coated side up), over hot mirror disc. See *Figure 1.10* for correct orientation of coated side of hot mirror. Place spring washer over wide band hot mirror.
1.10	Heat Sink Lamp holder	Place contact holder onto lamp socket of heat sink lamp holder. Lower this assembly onto the optics carrier. All layers of this assembly must be held securely together. Pick up this assembly and place it onto the *IS* bracket. Insert two long hex head cap screws into heat sink lamp holder. Tighten cap screws. Use 3/32" hex key. Check illumination system for dirt.
1.11	Power Cord	Place the contact/cord assembly through left slot of textured side of back cover. Place the optics assembly into nest T-12100. Insert the contacts into the slots of the lamp carrier assembly (white wire on left, black wire on right). Press the wire into wire groove. Place the back cover on to the optics assembly. Attach the back cover to the optics assembly with screw between ear insulators. Tighten screw. Place lamp into lamp holder.
1.12	*VS* Housing	Place the *CM* slider onto the bottom of *VS* chassis assembly. Loosen the two center chassis screws holding *IS* to the *VS*. Place the optics section into housing. Retighten these two chassis screws. Install one short and two long screws into assembly.

■ **Note:** Lower two screw heads must not interfer with slider motion.

1.12 *VS* Housing cont'd

■ **Note:** Lower two screw heads must not interfer with slider motion.

Insert the tabs of new CMH button in CM slider at the bottom of the housing.
Attach inner and outer left insulator ears.
Clean both eyepiece lenses.
Insert eyepiece lenses.
- Plano lenses: insert either way
- +2 Diopter lenses: insert concave side out

Install new rubber eye cups.

1.13 Lamp Cover

Inspect that lamp is all the way into heat sink lamp housing.
Slide the lamp cover down into the assembly.

1.14 Head band bracket

Attach BIO to the headband browband.
Insert bracket screw through slotted holes so that it passes through spacer and washer. Washer will be on knob side of the bracket.
Attach knob and tighten finger tight.

1.15 Test BIO

Put BIO on head.
Look at object held in hand, arms length. If the image appears as a double image, then the unit is misaligned. Some part of the visual system has become damaged and misaligned. The unit must be evaluated on laser alignment equipment at Welch Allyn. Return unit to Welch Allyn Technical Service Dept. for evaluation and or repair.

End Reassembly

Model 74201 Battery Pack

2.1	Back Case	Unscrew and remove two screws from back of battery pack. Carefully separate back of case from front case.
2.2	Battery	Unplug battery from circuit board.
2.3	Circuit Board	Pull knob off. Unscrew potentiometer nut. Gently pull board straight out of front case.

End Disassembly of 74201 Battery Pack

Reassembly

2.4	Circuit Board	Insert replacement circuit board into front case. Place hex nut on potentiometer and tighten. Position knob on end of shaft with flat of shaft aligned with spring clip of knob.
2.5	Battery	Plug a fully charged battery into circuit board connector. Place battery into case with wire exiting battery on lower left side. Place connector in space on knob side of case.
2.6	Back Case	Engage back case to front case at bottom. Gently push on circuit board at side opposite knob so that cases will come together. Gently press cases together at top. Secure with two phillips head screws.

End of Reassembly of 74201 Battery Pack

Model 74241 Wall Bracket Disassembly

3.1	Back Cover	Remove two screws at back of wall bracket. Pull back cover off at the screw end. It will hinge at the tabs on opposite end.
3.2	Wiring Harness	Remove knob by pulling straight off. Unscrew hex nut from potentiometer. Reach inside and pull indicator lamp from hole in case. Pull spade connectors from micro-switch.
3.3	Microswitch Actuator	Unscrew two nuts from studs. Remove star washers. Pull micro-switch from two studs. Pull actuator from case.

End Disassembly 74241 Wall Bracket

Model 74241 Wall Bracket Reassembly

3.4	Microswitch Actuator	Position micro switch with actuator towards screw holes in back cover. Secure with two star washers and nuts. Position actuator into slot in case. Press it up and down to assure it operated freely.
3.5	Wiring Harness	Insert shaft of potentiometer through hole in heat sink plate. Position potentiometer shaft through hole in the case. Make sure that the alignment tab of the potentiometer is inserted into the hole next to potentiometer shaft hole. Tighten potentiometer shaft nut. Insert pilot light hole in case over split tang molded onto case. Put “power in” jack in other slot closest to rear of case. (Two wires go to this jack). Put “power out” jack in other slot closest to front of case. (3 wires go to this jack). Attach spade connectors from harness to micro switch.

Model 74241 Wall Bracket Reassembly cont'd

3.6	Back Cover	Engage tabs and back cover into slots of case. Close back cover onto case. Operate black actuator to assure that it is operating micro switch. Insert and tighten two screws.

End Reassembly of 74241 Wall Bracket

Required Tools for BIO

General purpose tools:

3/32” hex key	
Peer #7 tweezers	
#2 phillips screwdriver	(Cresent #2501)
Long nose pliers	(Xcelite 91 cg)

Welch Allyn Tools and Fixtures:

T-12169	Lens retainer push tool
T-12196	Optics system assembly nest
T-12291	Electrical contact assembly nest
T-12198	Final Illumination assembly

Figure 1.7

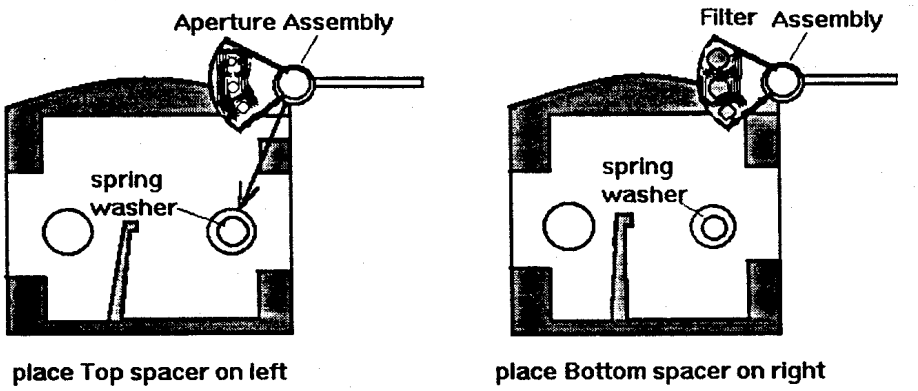
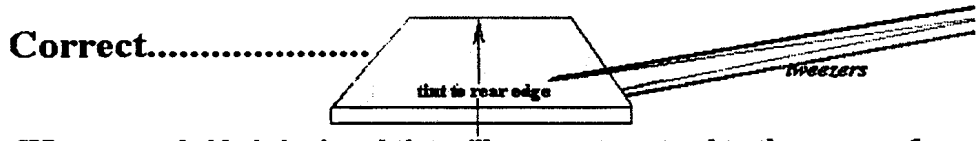


Figure 1.7 Aperture spacer assembly

FILE: BIO.BMP

Hold Hot Mirror up so you can see reflection of ceiling lights for this test. A redish tint will show on the glass.



When coated side is 'up', red tint will appear to extend to the rear surface.

When coated is side is 'down', the redish tint will not extend to the rear surface.

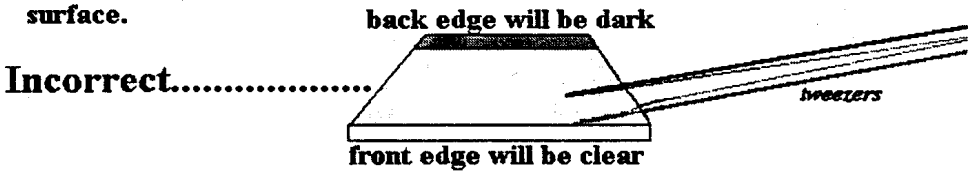


Figure 1.10 Identifying coated side of Wide Band Hot Mirror.....Method A

file BIO1.BMP

Figure 1.10 a

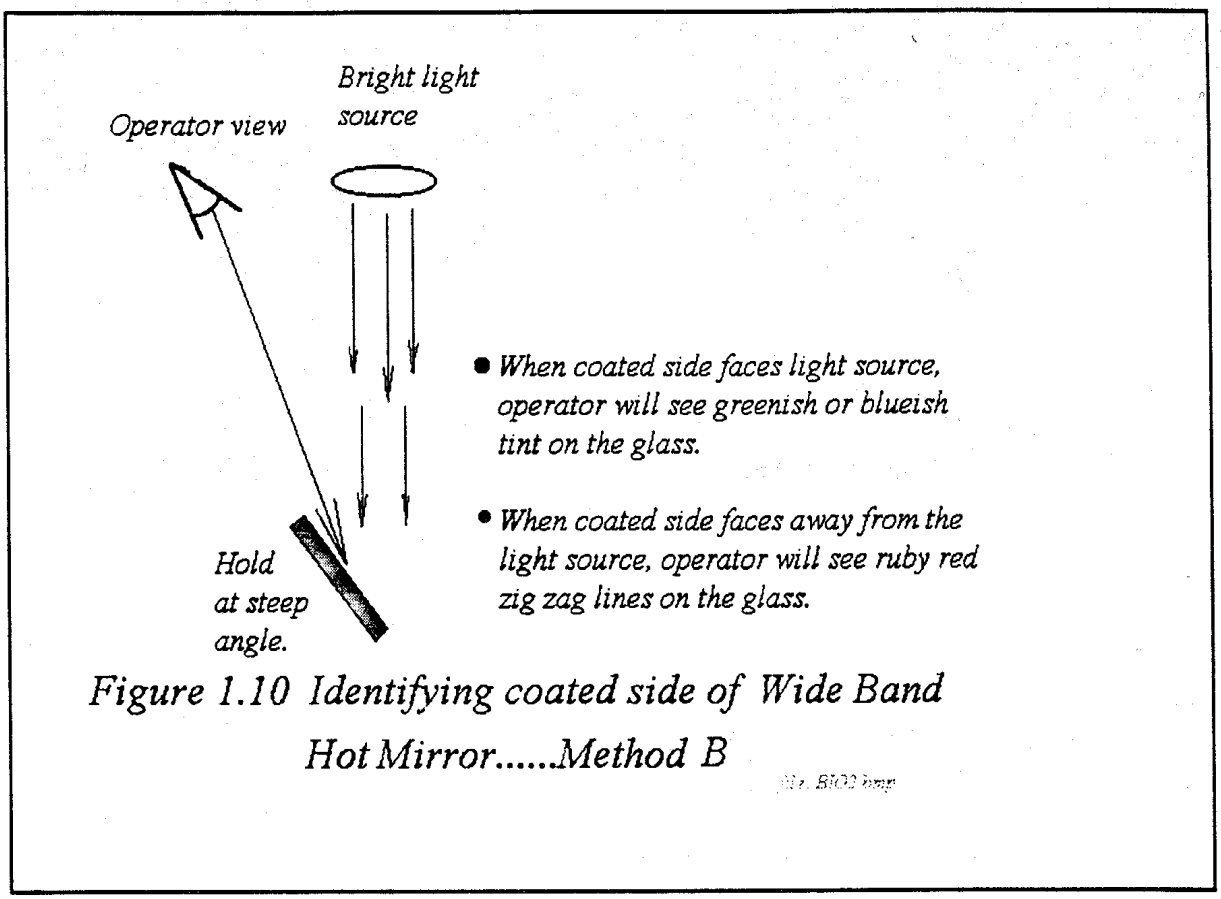

Bright light source
Operator view
Hold at steep angle.
When coated side faces light source, operator will see greenish or blueish tint on the glass.
When coated side faces away from the light source, operator will see ruby red zig zag lines on the glass.

Figure 1.10 Identifying coated side of Wide Band Hot Mirror.....Method B

Figure 1.10 b

This manual is now part of the Traditional Instruments Service Manual

Service Manuals
Lighting

Section 18

Welch Allyn B.I.O 2 Model 12500

Binocular Indirect Ophthalmoscope

Index

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74201	B.I.O. 2 Battery Pack	2	9
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Special Instructions for B.I.O. 2 Service

Clean all returned items by wiping with a solution of10% Clorox / 90% water. Do not use alcohol or other chemicals to clean the B.I.O. Inspect the unit, especially alignment prior to disassembly. Duplicate (if possible) the customer problem.

Important: <u>Check alignment before and after service</u>.

1. Put B.I.O. 2 on head.

2. Look at object held in hand, arms length. If the image appears as a double image, then the unit is mis-aligned. The B.I.O. 2 unit must be evaluated on laser alignment equipment at Welch Allyn. Return to Technical Service Dept. for evaluation and or repair. Proceed with repairs only on units with good alignment.

Disassembly of Model 12500 B.I.O. 2

Refer to Drawing 125016 and 125018 in repair parts catalog.

Abbreviations used in text:

- ***BIS*** B.I.O. 2 subassembly without headband
- ***CM*** Central mirror
- ***EM*** Eye mirror
- ***CMH*** Central mirror holder
- ***IM*** Illumination mirror
- ***VS*** Viewing system
- ***IS*** Illumination system

1.1 Lamp	Remove the lamp cover by sliding it up. Loosen adjustment knob and slide the B.I.O. all the way up. Remove lamp. Replace with new lamp. Clean new lamp with alcohol. Insert lamp with pin down. Slide lamp cover down over lamp. Verify operation of new lamp**.**
1.2 *VS* Housing	Unscrew and remove bracket knob. Support the *BIS* and remove bracket screw, bracket spacer with washer. Remove *BIS* from headband. Remove lamp as per step 1.1 above. Remove left and right outer insulators and left and right inner ear insulators. Remove two top screws near lamp. Remove back cover and cable/lamp contacts assemblies. Pry off and discard *CMH* button. Remove two outer bottom screws. Loosen two central chassis screws 3 turns. Do not completely remove them. Remove the *VS* housing from the B.I.O. 2 *VS/IS* assemblies.

1.3	*IS* Ass'y	Place B.I.O. 2 in nest fixture T-12198. Remove the two central chassis screws loosened in step 1.2. Separate the *IS* assembly from the *VS* assembly.
1.4	*IM* Yoke & *IM* Mirror	Remove hair spring with tweezers. Remove *IM* yoke And *IM* mirror/mirror holder sub-assembly from *IS* bracket.

Note: When the two hex cap screws are removed from the illumination sub-assembly in the following sequence, the illumination section may fall apart easily.

1.5	Illumination Lenses	Hold the *IS* sub-assembly horizontally. Remove two hex cap screws from heat sink lamp holder with a 3/32" hex key. Pull *IS* Bracket away from optics carrier. If equipped with diffuser option, remove diffuser. Remove compression spring and mirror tilt control. Remove aperture spacer assembly. Remove lens from the top aperture spacer. Open aperture spacer assembly. Remove aperture holder and washer, filter holder and washer. Remove heat sink lamp holder from contact holder. Remove spring washer**.** Remove wide band hot mirror.

Note: Coated surface of the wide band hot mirror should be on top as in **Figure 1.10**

		Remove hot mirror disc. Remove lens and lens spacer.
1.6	*VS* Assembly	Remove and discard rubber eye cups. Remove and clean both eyepiece lenses.

End Disassembly of B.I.O. 2

Reassembly of Model 12500 B.I.O. 2.
Refer to Drawing 125016 and 125018 in repair parts catalog.

Abbreviations used in text:

- ***BIS*** B.I.O. 2 subassembly without headband
- ***CM*** Central mirror
- ***EM*** Eye mirror
- ***CMH*** Central mirror holder
- ***IN*** Illumination mirror
- ***VS*** Viewing system
- ***IS*** Illumination system

Installation of:

1.7 Aperture and Filter Assys

Clean the aperture and filter assemblies before installing in aperture spacers.
Place the aperture spacers side by side as in Fig1.7. Top Spacer is put on left. Bottom Spacer is put on right.
Place a spring washer in the right circle recess of each aperture spacer as in Figure 1.7.
Place the aperture assembly (black aperture mask facing up), into the left (top) aperture spacer, on top of the washer.
Engage the detent with the aperture assembly.
Place the filter assembly (black filter mask up), into the right (bottom) aperture spacer, on top of washer.
Engage the detent with the filter assembly.
Carefully pick up left (top) aperture spacer and turn it over carefully.
Lay it on top of the other aperture spacer.
Hold the aperture spacers together and operate both levers.
Keep UP position with Filter lever on the right side.

1.8 Illumination System Bracket *IS* Lenses

Clean the objective lens and all parts of the Illumination system.
Place the objective lens (convex side facing down) into the *IS* bracket.
Place a lower aperture over the objective lens.
Press objective lens retainer into the *IS* bracket on top of the lower aperture. Use tool T-12169.

1.8 Illumination System Bracket *IS* Lenses Cont'd

Note: use plastic tweezers to hold lenses and wide band hot mirror

Place *IM* yoke and mirror assembly together using a new hair spring.
Place yoke and mirror assembly onto the *IS* bracket.
Place the *VS* subassembly into assembly nest T-12198.
Attach the *IS* bracket assembly to the *VS* subassembly with two chassis screws.
Place mirror tilt control in the hole of the *IS* bracket.
Insert compression spring into hole in mirror tilt control.
Place the aperture assembly (builtup in step 1.7) into assembly nest T-12196 (aperture side up.)

Note: After assembly, the filter lever will be on the right side.

Place a clean lens on top of the aperture spacer (round side up).

1.9 Diffuser Option

Place diffuser arm assembly into the Illumination bracket with pivot into pivot hole furthest from the lens.

Installation of:

1.10 Optics Carrier IS Lenses and Components

Place optics carrier (ears up), over lens of aperture spacer assembly (lower lens).
Place lens spacer into optics carrier, over lower lens.
Place upper lens (round side down) on top of lens spacer
Place hot mirror disc on top of lens.
Place wide band hot mirror (coated side up), over hot mirror disc. See *Figure 1.10* for correct orientation of coated side of hot mirror.
Place spring washer over wide band hot mirror.

1.11 Heat Sink Lamp Holder

Place contact holder onto lamp socket of the heat sink lamp holder.
Lower this assembly onto the optics carrier.
Pick up this assembly and place it onto the 'IS' bracket.
Insert two hex head cap screws into heat sink lamp holder.
Tighten cap screws. Use 3/32" hex key.
Check illumination system for dirt.

Installation of:

1.12 Power Cord

Place the contact/cord assembly through left slot of the textured side of the Back cover.
Place the optics assembly into the nest T-12100.
Insert the contacts into the slots of lamp carrier assembly (white wire on left, black wire on right).
Press the wire into wire groove.
Place the back cover on to the optics assembly.
Attach the back cover to the optics assembly with one screw between ear insulators.
Tighten screw.
Place lamp into lamp holder.

1.13 *VS* Housing

Place the *CM* slider onto the bottom of the *VS* chassis assembly.
Loosen the two center chassis screws that hold the *IS* to the *VS*.
Place the optics section into housing.
Re-tighten these two chassis screws.
Install one short and two long screws into the assembly.

Note: Check for interference between the two bottom screw heads and the slider.

Insert the tabs of ***CMH*** button into the *CM* slider at bottom of housing.
Attach inner and outer left and right insulator ears.
Clean both eyepiece lenses.
Insert Plano eyepiece lenses either way.
Insert +2 diopter lenses concave side facing operator.
Install new rubber eye cups.

1.14	Lamp Cover Assembly	Inspect that the lamp is fully into lamp housing. Slide the lamp cover down into the assembly.

Installation of:

1.15	Head Band Bracket	Attach B.I.O. 2 to the headband browband. Insert bracket screw through slotted holes and through spacer and washer. Washer on knob side of bracket. Attach knob and tighten finger tight.
1.16	Test B.I.O. 2	Put B.I.O. 2 on head. Look at object held in hand, arm's length.

Note: If the image appears as a double image, then the unit is mis-aligned. Some part of the visual system has become damaged and mis-aligned. The B.I.O. 2 unit must be evaluated on laser alignment equipment at Welch Allyn. Return to Welch Allyn Technical Service Dept. for evaluation and or repair.

End Reassembly of B.I.O. 2

Disassembly of Model 74201 Battery Pack (B.I.O. 2)

2.1	Back case	Unscrew and remove two screws from back of battery pack . Carefully separate back case from front case.
2.2	Battery	Unplug battery from circuit board.
2.3	Circuit board	Pull knob off. Unscrew potentiometer nut. Gently pull board straight out of front case.

End Disassembly of 74201 Battery Pack

Reassembly of Battery Pack

2.4	Circuit Board	Insert replacement circuit board into front case. Place hex nut on potentiometer and tighten**.** Position knob on end of shaft with flat of shaft aligned with spring clip of knob. Press knob on shaft.
2.5	Battery	Plug a fully charged battery into circuit board connector. Place battery into case with wire exiting battery on lower left side. Place connector in space on knob side of case.
2.6	Back case	Engage back case to front case at bottom. Gently push on circuit board at side opposite knob to enable closing the cases together easily. Gently press cases together at top. Secure with two phillips head screws. Perform function and safety tests per latest revision of Welch Allyn documentation.

End Reassembly of 74201 Battery Pack

Disassembly of model 74241 Wall Bracket (B.I.O. 2)

3.1	Back cover	Remove two screws at back of wall bracket. Pull back cover off at the screw end. It will hinge at the tabs on opposite end.
3.2	Wiring Harness	Remove knob by pulling straight off. Unscrew hex nut from potentiometer. Reach inside and pull indicator lamp from hole in case. Pull spade connectors from micro-switch.
3.3	Micro Switch Actuator	Unscrew two nuts from studs. Remove star washers. Pull micro-switch from two studs. Pull actuator from case.

End Disassembly 74241 Wall Bracket

Reassembly

3.4	Micro Switch Actuator	Position micro switch with actuator towards screw holes in back cover. Secure with two star washers and nuts. Position actuator into slot in case. Press it up and down to assure it operates freely.
3.5	Wiring Harness	Insert shaft of potentiometer through hole in heat sink plate. Position potentiometer shaft through hole in the case. Make sure that the alignment tab of the potentiometer is inserted into the hole next to potentiometer shaft hole. Tighten potentiometer shaft nut. Insert pilot light into hole in case over split tang molded into case. Put “power in” jack In slot closest to rear of case. (Two wires go to this jack) Put “power out” jack in other slot closest to front of case. (3 wires go to this jack) Attach spade connectors from harness to Micro switch.

Reassembly cont'd

3.6	Back cover	Engage tabs of back cover into slots of case. Close back cover onto case. Operate black actuator to assure that it is operating micro switch. Insert and tighten two screws.
3.7	Test	Perform function and safety tests per latest revision of Welch Allyn documentation.

End Reassembly of 74241 Wall Bracket

Required Tools for B.I.O.2 Service

General purpose tools:

3/32" hex key

Peer #7 tweezers

#2 phillips screwdriver (Crescent #2501)

Long nose pliers (Xcelite 91cg)

Welch Allyn Tools and Fixtures:

T-12169	Lens retainer push tool
T-12196	Optics system assembly nest
T-12291	Electrical contact assembly nest
T-12198	Final illumination assembly

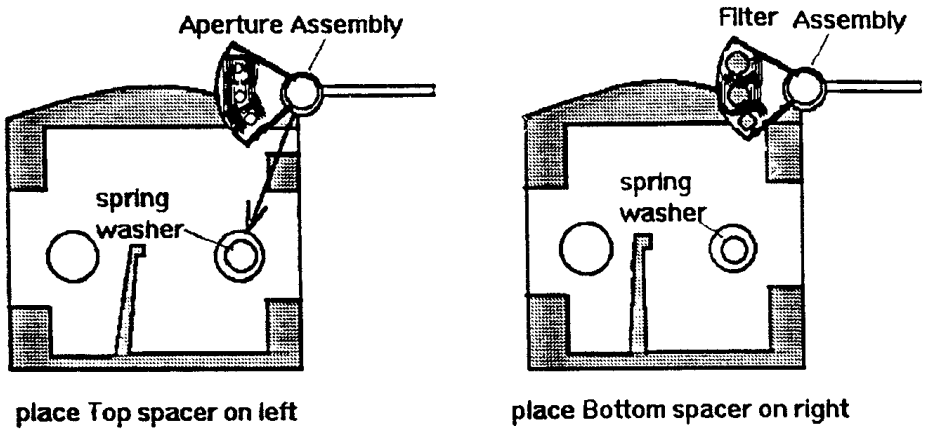


Figure 1.7 Aperture spacer assembly

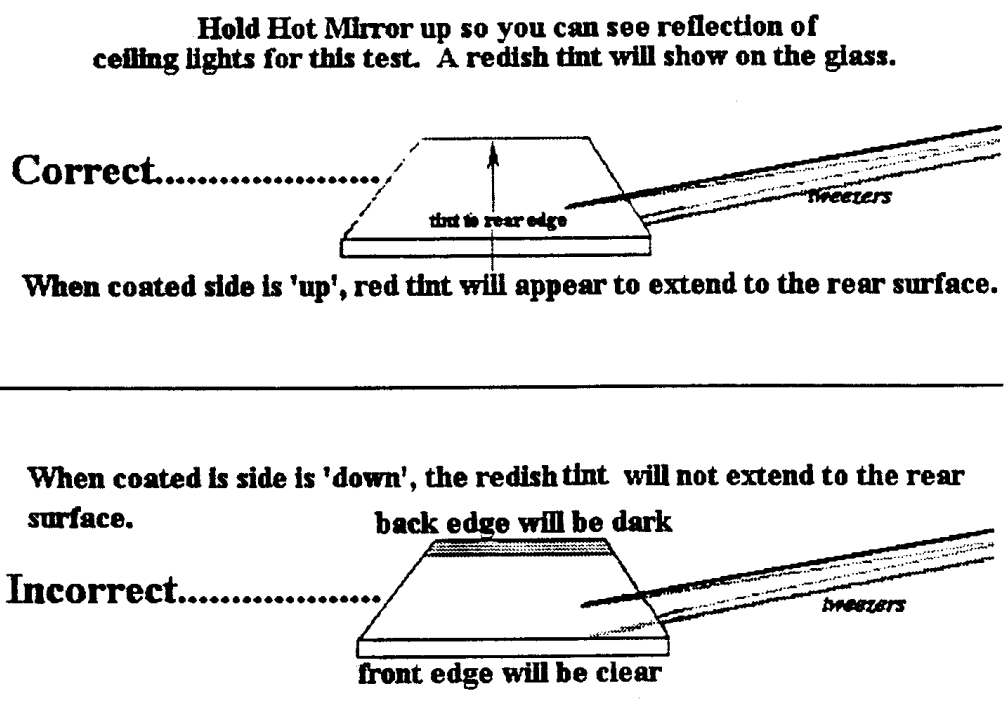
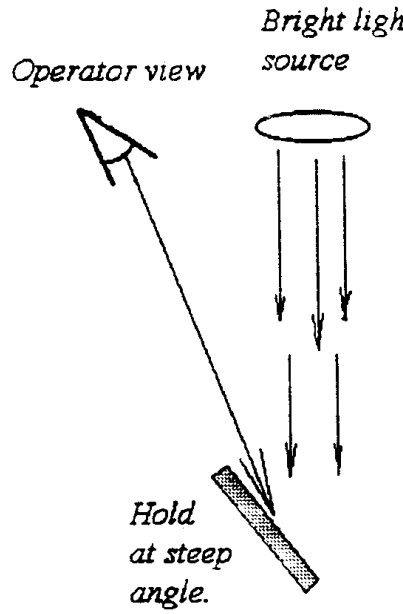

Hold Hot Mirror up so you can see reflection of
ceiling lights for this test. A redish tint will show on the glass.
Correct.....
tint to rear edge
tweezers
When coated side is 'up', red tint will appear to extend to the rear surface.
When coated is side is 'down', the redish tint will not extend to the rear surface.
back edge will be dark
Incorrect.....
tweezers
front edge will be clear

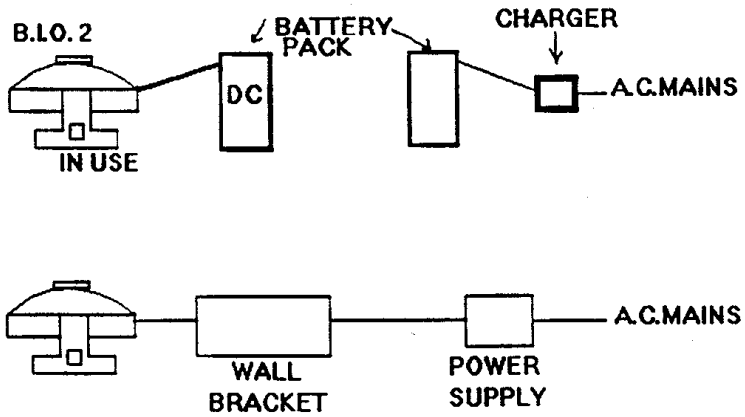
Figure 1.10 Identifying coated side of Wide Band Hot Mirror.....Method A



- *When coated side faces light source, operator will see greenish or blueish tint on the glass.*
- *When coated side faces away from the light source, operator will see ruby red zig zag lines on the glass.*

Figure 1.10 Identifying coated side of Wide Band Hot Mirror.....Method B

BLOCK DIAGRAM of connections for BIO 2



Section 19

CompacSet

CompacSet Components:

21110 2.5 Volt Otoscope
12810 2.5 Volt Ophthalmoscope
74001 CompacSet, Handle Only

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog. Clean all returned sets by wiping with a solution of 10% Clorox / 90% Water. Use special tools, lens cleaner, and lens tissue as listed in appendix. Begin with a thorough inspection of CompacSet. Understand customer complaints and causes.

Repair procedures for the CompacSet include:

A. Battery Replacement

B. Lamp Replacement

C. Otoscope Repair / Inspection

D. Ophthalmoscope Repair / Inspection

E. Inspection of CompacSet Functions

A. Battery Replacement

The CompacSet requires either two AA Alkaline batteries or the Welch Allyn rechargeable battery PN 72610.

Remove battery cover and replace batteries.

B. Lamp Replacement

Lamps are removed and replaced from the bottom of the ophthalmoscope body. The lamp for the otoscope is in the Otoscope Illuminator Assembly. See C3 below.

C. 21110 2.5 Volt Otoscope Disassembly:

1.	Otoscope Body	--	Unscrew Otoscope Body from CompacSet Handle.
2.	Otoscope Illuminator Ass'y	--	Unscrew Illuminator Assembly from CompacSet pivot assembly.
3.	Lamp	--	Pull lamp straight out of bottom of otoscope illuminator assembly.
4.	Lamp Collar	--	If lamp is loose in otoscope illuminator assembly: Remove and replace lamp collar from bottom end of otoscope illuminator assembly (use fine tweezers).
5.	Lens	--	Slide lens out of Otoscope Body. Inspect lens and seal.

21110 Reassembly

6.	Lens	--	Clean lens and slide lens into Otoscope Body Assembly.
7.	Lamp Collar	--	Insert replacement lamp collar into Otoscope Illuminator Assembly through bottom. (Points of collar should face up).
8.	Lamp	--	Clean lamp and carefully insert into bottom of Otoscope Illuminator Assembly.
9.	Otoscope Illuminator Assembly	--	Screw Illuminator Assembly onto CompacSet Otoscope pivot assembly.
10.	Otoscope Body Alignment	--	Screw Otoscope Body over Illuminator. Align Otoscope with case and fold into handle. (See page 2 of Operating Instructions). If Otoscope does not align properly, then loosen collar set screw with .035" Hex Key. Rotate collar until detent engages. Tighten set screw.
11.	Test	--	Turn Illuminator on.

Inspections for Repaired Otoscopes

1. Check fit of disposable and re-useable speculums.
2. Check windows and lenses for cracks, chips or other defects. Check for any stray light that interfers with the viewed image.
3. Check the scope for scratches, physical damage, rough surface before repairing.
4. Clean repaired scope.

D. 12810 2.5 Volt Ophthalmosccope Disassembly

Special Instructions:

Clean all returned Ophthalmoscopes by wiping with a solution of 10% Clorox / 90% Water.

Do not apply alcohol, chemicals or water to the mirror or lenses. Optical tube base disassembly is not recommended or covered in this manual.

Notes:

1. " *SLP* " means "Small Loose Parts" and cautions you to disassemble carefully, reducing the chances of losing small, possibly spring loaded, parts.

2. Strap wrench T-10913 will loosen the lock ring.

3. Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog.

1.	Lamp	--	Unscrew Ophthalmoscope from CompacSet Handle. Pull lamp from bottom of Ophthalmoscope optical tube. (Use tweezers)
2.	Bumper	--	Pull corner, peel back. (Use fingers)
3.	Cover Assembly (Doctor Side)	--	Loosen retaining ring. (Use strap wrench T-10913)
4.	2 Screws	--	Unscrew 2 screws (use .05Torx bit) remove cover assembly (Doctor Side) ***SLP***. Remove (from Doctor-side cover): Lens disc, indexing spring (128013), lever, multiplier and magnifier link. (These last two items will be installed into the Doctor Side cover during reassembly. During disassembly, however, they usually fall off their respective pivots and lay on top of the aperture dial assembly.)

D. 12810 2.5 Volt Ophthalmosccope Disassembly, cont'd

5.	Ophthalmoscope Body Assembly	--	Remove N.D. (Number Dial) filter assembly. (On newer models, this part will not have the small filter on top). Remove aperture disc assembly, detent ball and indexing spring (1228024). Remove 2 screws holding lens holder assembly. Remove lens holder assembly and filter assembly.

Reassembly

6.	Ophthalmoscope	--	Insert optical tube base assembly into Ophthalmoscope body. Inspect filter over shiny metal surface and look through filter at its own shadow. One side will show a 'blue' tint. Place tint side of the filter towards the inside of the scope during reassembly. When using new replacement filter, remove protective polyethylene films 2 sides. Insert filter into filter housing and place into Ophthalmoscope body with filter housing finger tab towards top of the scope. Place lens holder assembly into position and fasten with 2 screws. Place indexing spring (128024) onto raised anchor. Rounded end of indexing spring facing hub. Hole in disc at top, apertures at bottom, insert indexing (coil) spring (116119) into hole and place ball bearing on top of it. Place N.D. filter assembly on top of the center of the aperture disc assembly with filter assembly pivot in hole at base.
7.	Cover Assembly with Magnifier Lens (Doctor Side)	--	Place lever into position in the (-) negative position. (-) side place indexing spring (128013) over lever and onto raised anchor. (Rounded end of indexing spring should face the lens disc assembly hub as shown in repair parts diagram).
8.	Lens Disc Assembly	--	Clean disc. Place disc on hub (Number side down, engaged with detent).

D. 12810 2.5 Volt Ophthalmosccope Disassembly, cont'd

9.	Multiplier	--	Place multiplier on top of lens disc, engaged with hub, pivot facing up, and lenses at the top of the assembly (as shown in the repair parts diagram). Connect multiplier to lever with magnifier link, thick end of link towards the magnifier, and with the curved side towards the hub as shown in the parts diagram.
10.	Cover Assembly (Doctor Side)	--	Place cover onto Ophthalmoscope body assembly. Place ring onto base with numbers "128" right side up. Tighten ring, screws. Install bumper.
11.	Lamp	--	Install lamp, engage alignment pin of lamp into groove of lamp socket.
12.	Ophthalmoscope Alignment	--	Screw Ophthalmoscope body onto ophthalmoscope pivot assembly of CompacSet. Align Ophthalmoscope with case and fold into handle. If it does not align properly, then loosen set screw with .035" hex key. Rotate collar until detente engages. Tighten set screw.
13.	Test	--	Turn ophthalmoscope on.

End 12810

Inspections for Repaired Ophthalmoscope

1. Operate all slide switches, rotating knobs and discs to determine whether or not detents are operating correctly and to determine if the part operates smoothly, positively, and through full stroke. Look through the scope to determine that the aperture, filter, or lens is correctly aligned through each detent position.

2. Check cleanliness of the lens dial. No scratches, dirt, glue, or any material should be visible.

3. Check the illuminated and non-illuminated numbers on the lens dial. They should be in the center of the aperture.

4. Check projected images for shadows, dirt, and filament images using the aperture dial and the slide switch if so equipped.

Inspections for Repaired Ophthalmoscope, cont'd

5. Check windows for cracks, streaks, spots or anything that would obscure the viewed image.

6. Check for any stray light that interferes with looking through the scope. Project a fixation spot into a darkened box. Look through the peephole with a lens setting of '0'. There should be no bright streaks in the image, or any light appearing in the dark area surrounding the projected spot.

7. Check the scope for scratches or physical damage BEFORE the repair and after as well.

8. Clean the repaired scope.

E. Inspection of Compac Set Handle Functions

1. Check doors and latches for fit and function. Doors should stay closed on detent.

2. Check pivot and swivels.

3. Check light switch and flicker.

4. Check case for scratches or other cosmetic blemishes.

IF A PROBLEM IS FOUND IN INSPECTION / FUNCTIONAL CHECK, THEN:
SALVAGE HEADS, BATTERY, SPECULA, AND REPLACE CASE.

APPENDIX

Tools/ Materials/Supplies

Strap Wrench (T-10913)

Apex Torx Bit: Tx 05

Hex Key: .035”

Pin Vises “C” Size (L.S. Starrett Co. 166c) for Hex Keys

Tweezers (Grobert Peer #7 Stainless Steel)

Glass Cleaner

Lint Free Wipes / Swabs

Jewelers Screwdriver with 1/16” Flat Blade

Small Ultrasonic Bath ie: *Pro-Craft Model 23.577-1

Ultra Sonic Bath Cleaning Solution ie: Micro™ Liquid Laboratory Cleaner

Miller Stephenson Aero-Duster #MS-222

De-Ionized Water.

Small Stainless Steel Tubs (1 qt. capacity or less)

Section 20

COMPACT OPHTHALMIC SET™

Compact Ophthalmic Set Components:

13010 2.5 Volt Pocketscope Ophthalmoscope
16201 Pocketscope Retinoscope
42010 & 42011 Transilluminator
74031 Compact Ophthalmic Set Handle only

Refer to Repair Parts Catalog PN 900299 for illustrations, parts listing.

Clean all returned sets by wiping with a solution of 10% Clorox / 90% Water. Use special tools, lens cleaner, and lens tissue as listed in appendix. Begin with a thorough inspection of Compact Ophthalmic Set. Understand customer complaints and causes before starting repair.

Repair procedures for the compact ophthalmic set include:

A	Battery replacement	pg.1
B	Lamp replacement for ophthalmoscope,retinoscope, and transilluminator)	pg.1
C	Retinoscope repair and inspection	pg.2-3
D	Ophthalmoscope repair and inspection	pg.4-7
E	Compact handle battery door and pad, inspection	pg.7
F	Transilluminator lamp and lamp collar replacement	pg.8

A. Battery Replacement

The Compac Ophthalmic Set requires either two AA Alkaline batteries or the Welch Allyn rechargeable battery PN 72610. Remove battery cover and remove batteries.

B. Lamp replacement on all items.

Lamps are moved and replaced from the bottom of retinoscope, ophthalmoscope and transilluminator.

Hold lamp with rubber gloves or cloth.(Do not handle it with fingers.)
Wipe with cloth dampened in alcohol to remove dirt, skin oils or grease.
Align the pins of 08400 and 03900 lamp bases with corresponding slots of the lamp socket.
The 03400 lamp for the transilluminator does not have a pin. In all cases, the lamp will be held in place by a retainer (a 'contact loop' is used in retinoscope).
Inspect the lamp retainer when replacing lamps.

C. 16201 Pocketscope Retinoscope Disassembly

C1. Retinoscope Body -- Unscrew retinoscope body from handle.
Hold knurled ring with thumb of one hand.
Unscrew retinoscope with other hand. (It is not necessary to remove the rubber bumper for disassembly. (Screws are underneath the label.)

C2. Optical Carrier Assy-- Peel label from doctor-side cover.
Unscrew two screws from the doctor-side cover. (Use 05 Torx bit).
Open body and remove optical carrier assembly from patient-side cover. Do not touch mirrored surfaces.

C3. Main Sleeve Sub-Assy-- Remove the main sleeve sub-assembly once the body halves are apart.
Remove the index ring from the top of main sleeve.

C4. Patient-side window and mem bracket.

NOTE: The mem card braket and patient -side window, can be removed if necessary.

Pry mem card bracket off.
Do not scratch surfaces of the body half. (If the mem card bracket is removed and replaced more than twice, the adhesive component of the window seal tape will weaken.
Replace with new tape.
Remove the patient-side window from body half by placing the the window down against the table.
Place a pencil with a rubber eraser on the window to hold it down while pulling up on the body half.The window will come off and remain on the table when the body lifts up off of it.
Remove old adhesive tape from the body with alcohol.

C5. Patient Side Window Assy--
Clean inside of mem card bracket with alcohol & swab.
Wait for the alcohol to evaporate. Use tweezers to remove protective cover from one side of the window seal tape.

C5. Patient-side Window Assembly, cont'd.

Position tape over outside of patient side cover over area t hat window will seat in.
Press the tape down securely. Remove center portion window seal tape.
Remove other protective cover of tape. Put the patient sidewindow (either side up) into the mem card bracket.
Use T13458 alignment nest to position mem card bracket/ window assembly into patient side cover and press onto tape.
Place assembly into patient side window.
Press T13278 and move slide of T13278 forward until it reaches a stop..
Inspect that window seal is not visible from the outside.

C.6 Optics Carrier-- Blow out both cover halves.
Place patient side cover in nest T13153.
Put optics carrier in patient side cover.
Put the main sleeve subassembly into patient side cover with taped leg of lens holder facing up and away from Patient side cover.

C7. Doctor-Side Cover-- Place Doctor side cover over patient side cover. (If the rubber bumper was missing or removed, install a new one in this step.)
Insert 2 back-cover screws and tighten using T9173-19.
(Do not use covers or screws more than 2 times.)
Attach label.

C8. Lamp-- Insert lamp into base.

C9. Test-- Test assembled retinoscope .

C10. Label-- After passing tests, wipe label mounting area area with an alcohol dampened swab. Attach new label over the screws when dry.

End 16201 Pocketscope Retinoscope Assembly

D. 13010 C.O.S. Pocketscope Ophthalmoscope Disassembly

D1.	Lamp--	Unscrew pocketscope ophthalmoscope from handle. Use tweezers to pull lamp from bottom of ophthalmoscope optical tube base.
D2.	Bumper--	Use fingers to pull back on corner of bumper and remove bumper.
D.3	Cover Assembly-- (Doctor Side)	Remove both screws . Un-screw 2 screws (05 Torx bit). Unscrew the retaining ring with the T10913 strap wrench.
D4.	Lens Disc Ass'y--	Remove cover assembly (doctor-side) Remove lens disc, multiplier lever assembly, and detent spring. (Magnifier lens is bonded to the doctor side cover).
D5.	Ophthalmoscope-- Patient Side	Remove numeral illuminator. Remove optical tube base assembly. Remove aperture disc assembly, covers, ball bearing, shaft, and detent spring (Coil spring) Remove aperture rack assembly and shifter detent spring.

13010 Pocketscope Ophthalmoscope Reassembly:

D6.	Aperture Sub assembly--	Blow off skid plate with compressed air. Snap skid plate on tree T8124 with double ridge facing up. Install aperture dial (aperture side facing down) onto the double ridge of skid plate. Insert dowel pin. Drop small coil spring into small hole of aperture near edge of dial.

Caution: If the ball accidentally falls into one of the fixation holes, clean the hole before starting over.

13010 Pocketscope Ophthalmoscope Reassembly cont'd:

D6.	Aperture Sub Assy-- (cont'd)	Blow off second skid plate. Position it with the 'ridge' side down Place it on top of the dial Lift the assembly from tree T8124 Place this dial assembly into the optical tube base. It will snap into place when all the way in. (**Do not invert)** Rotate the dial to check for smoothness and positive detent operation.
D7.	Shifter Detent--	Insert the shifter detent (Flat Spring) over the mirror holder post.
D8.	Magnifying Lens--	Blow off both sets of magnifiers with compressed air. Place a bead adhesive in slot of the doctor side cover where the magnifying lens will be placed. Install magnifying lens into opening of cover with the round side down, and flat side facing you. Gated end of magnifying lens should face towards scope bottom. Glue in with1/32" dot of Locktite 402 on each side of lens.
D9.	Multiplier--	Place the multiplier into the multiplier lever so that all of the small tabs are facing the same direction. Clean the multiplier with alcohol.
D10.	Multiplier Lever--	Place the assembled multiplier and multiplier lever assembly onto the center hub of the doctor side cover with the tabs of the assembly facing down. These tabs limit the rotation of lever.
D11.	Detent Spring--	Place detent spring into doctor side cover, round bumps engaged w/multiplier lever. Press all the way into the cover.

13010 Pocketscope Ophthalmoscope Reassembly cont'd:

D12. Lens Disc-- Inspect lens disc for dirt/scratches. Remove dust with blow off gun.Apply Moly33 greaseM11041 sparingly, in thin uniform coat to hub bearing of lens disc. Do not allow grease on lens disc. Place lens disc onto hub (number side down) by angling the disc down against detent spring.
Place lens disc down over center hub over multiplier lever.

D13. Shifter-- If a new shifter/filter assembly is required, install a new red free filter in the shifter. (There is no right or wrong side of filter glass.) Slide filter glass into shifter from the open end of the filter pocket. Place shifter (with installed red free filter installed) over shifter detent in mirror holder. Index the shifter to the right.

D14. Optical Tube Base-- Hold the optical tube base horizontally with the filter slide on top. Carefully lower the patient side cover onto the optical tube base so the button of the filter slide fits into the hole of the cover and the index shaft of the cover fits into the hole in the lower end of the optical tube base. Turn the assembly over carefully and place the numeral illuminator onto the optical tube base assembly so that the lite pipe pivot fits into right side hole of optical tube base.

D15. Cover Assembly-- Carefully lower the doctor side cover with the lens disk assembly in it over and onto the patient side cover with the optical tube base in it.
Place ring onto base with chamfer side up towards ophthalmoscope. Tighten ring. Insert two screws and tighten finger tight. Use 05 torx bit . Install bumper.

D16. Ophthalomoscope Alignment--

Screw ophthalmoscope body onto ophthalmoscope pivot assembly of compact handle. Align ophthalmoscope with case fold into handle. If it does not align properly, then loosen set screw with .035" hex key. Rotate collar until Detent engages. Tighten set screw.

General inspections for repaired ophthalmoscopes

1. Operate all slide switches, rotating knobs and discs to determine whether or not detents are operating correctly and to determine if the part operates smoothly, positively, and through full stroke. Look through the scope to determine that the aperture, filter, or lens is correctly aligned through each detent position.

2. Check the cleanliness of the lens dial. No scratches, dirt, glue, or any material should be visible.

3. Check the illuminated and non-illuminated numbers on the lens dial. They should be in the center of the aperture.

4. Check projected images for shadows, dirt, and filament images using the aperture dial and the slide switch if so equipped.

5. Check windows for cracks, streaks,spots or anything that would obscure the viewed image.

6. Check for any stray light that interferes with looking through the scope. Project a fixation spot into a darkened box. Look through the peephole with a lens setting of '0'. There should be no bright streaks in the image, or any light appearing in the dark area surrounding the projected spot.

7. Check the scope for scratches or physical damage before the repair and after as well.

8. Clean the repaired scope.

E. Inspection of compact handle functions

1. Check doors and latches for fit and function. Doors should stay closed on detent. Battery door should fit tightly. Replace battery door and or battery pad if necessary.

2. Check pivot and swivels.
Realign pivots to 12, 3, 6, and 9 o'clock positions by loosening set screw with .035" allen wrench and re tightening when aligned.

3. Check light switch for flicker.

4. Check case for scratches or other cosmetic blemishes.

NOTE:
If a problem is found in inspection / functional check, then:

Salvage the otoscope and ophthalmoscope heads, battery, specula, and replace only the C.O.S. handle.

F Transilluminator

1. Remove lamp collar--remove lamp from base. Remove the lamp collar from the base of the Transilluminator. Use tweezers.

2. Replace lamp collar-position lamp collar with the points facing up. Insert into transilluminator base with tweezers. Insert lamp to test.

Appendix
Tools/Materials/Supplies

Apex torx bit	TX-05
Hex keys:	.035"
Pin vises	“C” size (L.S.Starrett co.166c) for hex keys
Tweezers	(grobet peer #7 stainless steel)
Jewelers screwdriver	1/16" flat blade

Special Welch Allyn Tools

16201 Pocketscope retinoscope:

T13458	Alignment nest
T13278	Patient side window press
T13153	Nest

13010 Pocketscope ophthalmoscope:

T10913	Retaining ring strap wrench
T8124	Assembly tree

Materials available from Welch Allyn

M11041	Molly 33 grease

Section 21

767 Wall Transformer Service Manual

3.5 Volt Wall Transformer Disassembly:

Models 76710, 76712, 76714, 76716, 76720, 76722, 76724, 76726, 76730

Refer to corresponding diagrams in Welch Allyn Repair Parts Catalog. (This system is designed for 3.5 volts only).

Clean all returned sets by wiping with a soft cloth dampened with a solution of 10% Clorox/ 90% Water.

Begin with a thorough inspection of the 767 to understand customer complaints and causes of problem. Please contact Welch Allyn directly for clarification of any service, safety, or use related issues for any Welch Allyn product including the 767 Wall Transformer.

Listing of removal/replacement procedures:

A. Power Cord (Standard Length & 16" Domestic, Export)
B. Handle Assembly (Handle and Coiled Cord with Molex Plug)
C. Circuit Board
D. Fuses
E. Cradle Assembly
F. Illuminated Switch
G. Clock and Clock Battery
H. Third Handle Service

Appendix: Tools, Testing/Inspection/Test Procedures for Repaired 767s.

A. Power Cord Replacement

Abstract:
IEC connector accepts new plug. No disassembly. Unplug power cord from bottom of Wall Transformer unit. Refer to 767 Wall Transformer instructions PN 767036.

B. Handle Assembly Replacement

Abstract:
The Handle Assembly (handle and coiled cord) is designed to be replaced as a complete sub-assembly. The main housing - front (MH front), is removed and the handle is unplugged from the circuit board. The wires to the power switch and the optical sensors in the cradles are not unplugged. Wear ESD strap to protect PCB.

1. Remove MH-Front (Main Housing Front)

Unscrew six phillips head screws on the back of the 767. Use a phillips #2 screwdriver with a 3" (minimum) shank. Position the 767 on its back and seperate the MH-Front from the MH-Back. Take care not to pull the housings apart abruptly as this may result in pulling the wires and connectors. This might unplug them from the components to which they are attached. Slide (do not cut) the wire tie off of the MH-Back standoff.

CAUTION > > > **DO NOT PULL** the blue two-pin female connectors off of emitter and detector unless you have to. When reattaching connectors to components, (if the connectors do unplug from emitter and/or detector accidentally), reconnect them per Fig 1 on the next page. Any combination of improper connections IE: reverse polarity or crossing the detector wires over to the emitter or vice versa will destroy these components and or PC Board components.

2. Unplug the Handle

Disconnect the handle assembly molex connector (brown 4-pin female) from the pins on the circuit board. Replacing just the handle cord connector is not recommended.

3. Plug in the Handle

Note the colors of the wires on the plug of the new handle assembly. Match the colors of the wires with the color coding printed on the circuit board at the pins.

CAUTION > > > If the brown 4-pin female molex connector is plugged in wrong , then 8 DC volts will be available at the handle and cause the lamp to fail immediately. Position the strain relief in the cutout of the MH-Back with the long edge of the strain relief resting on the circuit board. (The front and back housings will not fully close if the strain relief is any other way.

Figure 1 - 767 Wiring PC Board Revision A

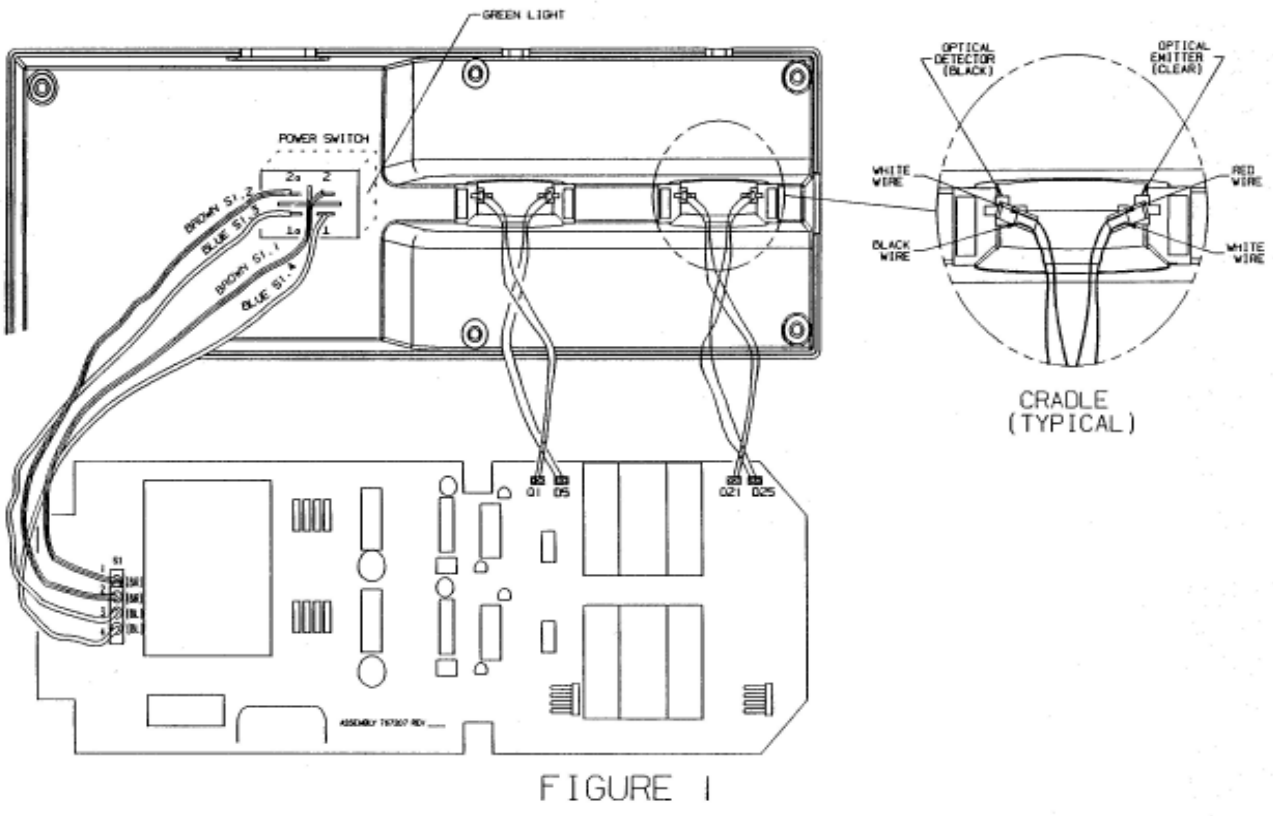
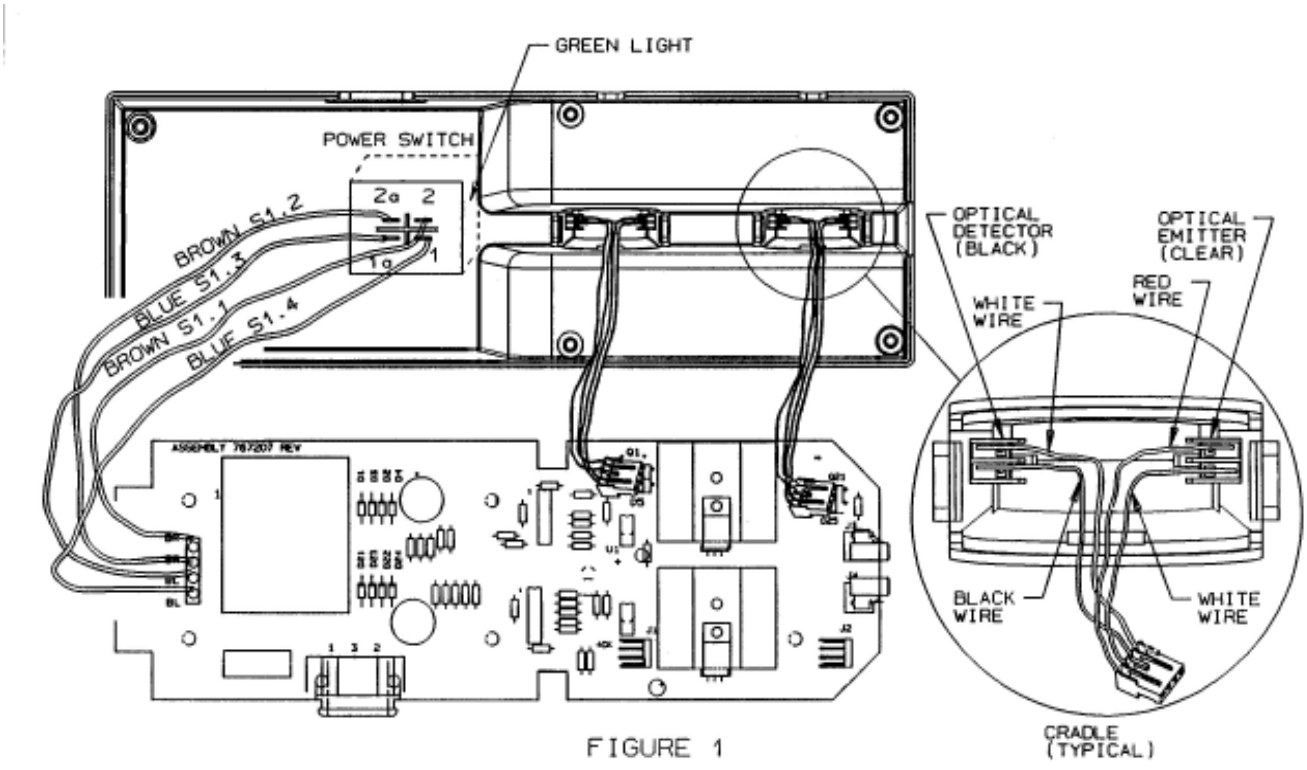


Figure 1 - 767 Wiring PC Board - 767207 Rev. B



NOTE: Lay the wires of the right handle assembly underneath the right heat sink. Inspect the wires as they exit from the molex connector to see if one or more contacts has moved out of the connector, IE: have they started to push out or become unseated? If this is the case, and the wire end of the contact is visible, then push the contact back into the connector block. For proper functioning, the pins must resist being forced out of the connector block when the connector block is pushed onto the pins of the PC Board. Otherwise a weak or intermittent connection will cause flickering. A cure is to remove the connector plug, remove the loose contact and bend the detent tab up. This will keep the contact in position within the connector block.

4. Install MH-Front Carefully position the MH-Front onto the MH-Back. Secure primary wires to tall standoff with wire tie so they won't get pinched between housings. Tighten the six phillips head screws to 4.5 inch lbs., +/- .5 inch lbs. Perform full functional check and test unit according to repair test found in Appendix.

C. Circuit Board Replacement

Abstract:
Circuit boards are to be replaced when any of the individual components on the board fail. Replacement of the circuit board entails removal of the MH-Front and unplugging wires from the power switch, unplugging the wires from the cradle emitter/detector, and unplugging the coiled cords. The MH-Front is reinstalled and the unit tested. Wear ESD protection.

1. Remove MH-Front Follow instructions in Section B-1, Pg. 2 to remove MH-Front.

2. Disconnect Wires Carefully unplug spade connections of 'S1' wires from spade contacts of power switch using a long nose pliers. Do not cut the wire tie*. Carefully unplug the two pin connectors from the emitter and detector with a long nose pliers.

***** The wire tie is required to keep wires away from transformer body.

3. Remove Circuit Board

Lay the 767 on its back. Remove six 6-32 x 3/4" phillips head screws and attached plastic washers. Lift board up. (The mounting plate under the MH-Back is no longer fastened to the MH-Back).

4. Replace Circuit Board

Lay the mounting plate (Pem studs pointing up) on the table with the notch up. Lower the MH-Back onto the mounting plate so that it mates with the notch in the mounting plate. Lower the replacement board (with transformer near two tall standoffs) into the MH-Back. Fasten it in place with six 3/4" long phillips head screws. (Early models have anti-static plastic washers between all 6 screw heads and the board). Tighten screws to 4.5 +/- .5 in. lbs. See Fig. 1.

5. Connect Board Wires

Attach the four wires from 'S1' to the power switch. See figure 1. Fasten 'S1' wires to the upper left standoff with wire tie. (All component position references are based on their position relative to the printing on the board). The wire tie which holds the four wires to the tall upper left standoff eliminates wire contact with the transformer. Use needle nose pliers to put the two-pin connectors onto the emitter and detector. Be careful not to bend the emitter and detector pins when placing the blue connectors to them according to Fig.1.

CAUTION > > > Refer to Figure 1 when reconnecting components.

Connect handle assembly plugs to board per instructions in Section B-3.

6. Attach MH-Front

Attach the MH-Front as per instructions in Section B-4.

7. Test Unit

Inspect/test 767 Wall Transformer per instructions in appendix.

D. Fuse Replacement

Abstract:
Fuses are easily changed by removing the MH-Front and locating the blown fuse on the circuit board. Inspect for other damage and replace fuses/ repair as required. Replace MH-Front. Perform all tests.

1. Remove MH-Front — Follow instructions in section B-1, Pg. 2, to remove MH-Front.

2. Inspect Board — Replace both line fuses when one is blown. Snap them out with a screwdriver. Test unit to find cause and effects of the over-current.

CAUTION > > > Do not substitute other fuses for the original Welch Allyn fuses. The 767 is designed to use the Welch Allyn International style fuses (delay type). North American style fuses must not be used in the 767 Wall Transformer.

3. Replace Fuses — Use only appropriate Welch Allyn replacement fuses and insert into fuse holders. (Domestic = 250MA, Int'l = 100 MA).

4. Replace MH-Front — Attach the MH-Front as per instructions in Section B-4.

5. Test Unit — Perform inspections/test found in Appendix.

E. Cradle Assembly Replacement

Astract:
Since the sensors are permanently mounted in the cradle, it is necessary to replace the cradle when the sensors malfunction. Upon opening the housing, note the position and orientation (polarity) of the blue connectors on the emitter and detector.

If they were not connected according to Fig. 1, then it is probable that a failure has occured in: the cradle sensors and or the PC board. Tampering is a possible explanation for this failure.

The connectors are disconnected from the cradle sensor leads. The cradle is then removed by depressing the tabs on the sides of the cradle (one at a time). Install new cradle and restore wiring as shown in Fig.1. Assemble unit and test.

NOTE: Dirt and or other foreign matter, might beome lodged in the emitter/ detector 'windows' in the cradle. This could prevent the handle from becoming active. Inspect these slots when diagnosing "handle won't light" complaint.

1. Remove MH-Front Follow instructions in B-1.

2. Disconnect Wiring Use needle nose pliers to carefully remove the two blue connectors from the cradle sensors.

3. Remove Old Cradle(s) While pulling at the cradle from the front of the unit with your fingers, depress each tab of the cradle from the inside of the MH-Front with a flat blade screwdriver until the cradle is free to move out of the MH-Front. See Fig. 2 next page.

4. Attach New Cradle Align the replacement cradle so that the 3/8" long tab on the inside of the cradle is up when the MH-Front is right side up. Press the cradle into the MH-Front evenly until it latches into place. When looking at the front of the 767, the chamfers of each cradle should be at the top of the cradles.

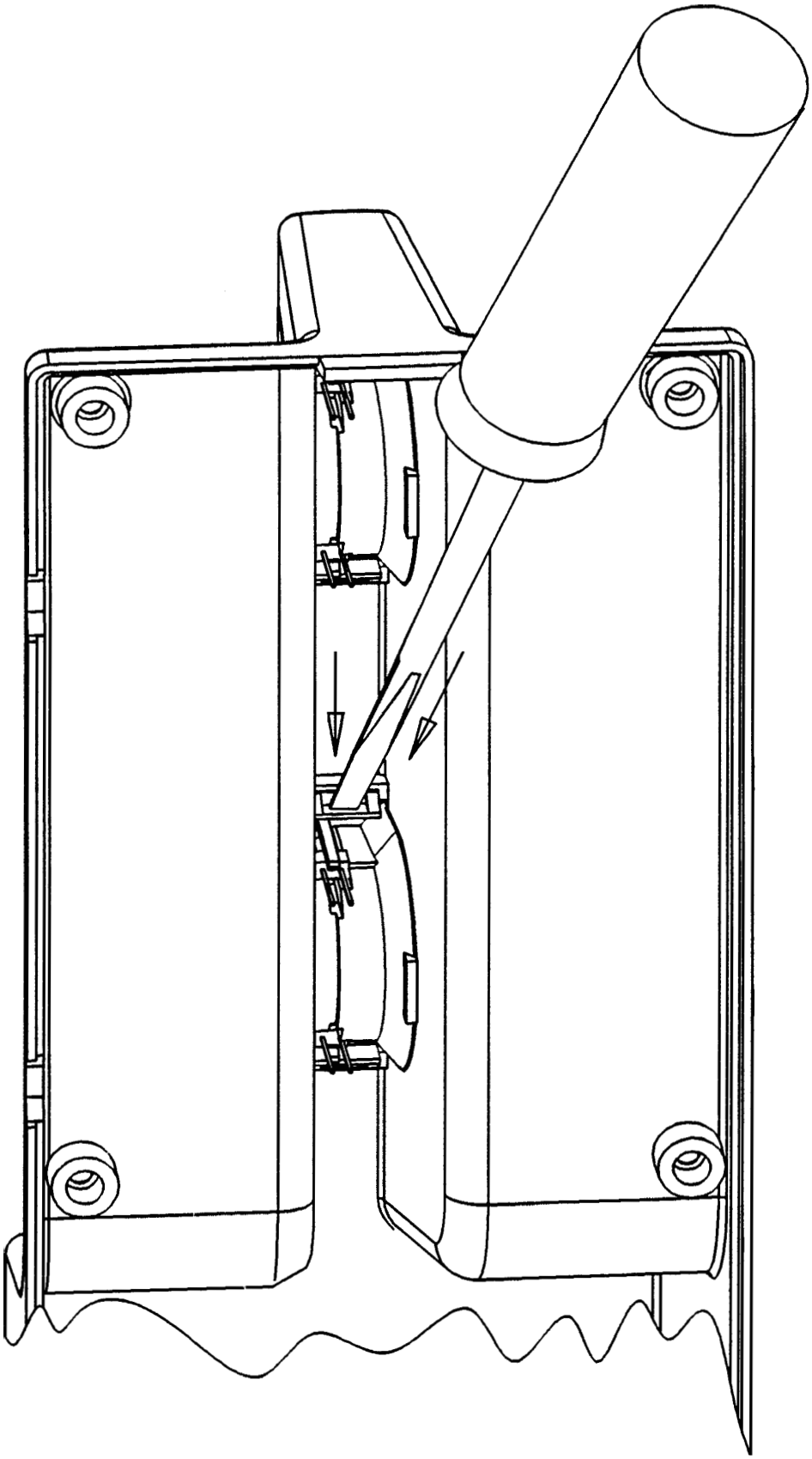
5. Restore Wiring Carefully align the pins of the component with the holes in the sockets of the blue connectors. The pins are easily bent. Carefully press the connectors onto the pins of the cradle sensors. Refer to Fig.1 wiring diagram.

CAUTION > > > When reattaching connectors to components, reconnect them per Fig. 1. Any combination of improper connections IE: reverse polarity or crossing the detector wires over to the emitter or vice versa will destroy these components and or PC board components.

6. Attach MH-Front Follow instructions in Section B-4.

7. Test Repaired 767 Inspect and test.

Figure 2, Cradle Removal



F. Illuminated Switch Replacement

Abstract:

The MH-Front is removed and the old switch is unlatched and pulled out. The four wires are disconnected one by one and connected in the same sequence and position, one by one, to the replacement switch. (The new switch must be aligned with the light towards the cradles). Once the new switch is pressed into place, verify that the wiring conforms to wiring diagram Fig.1. Reattach the MH-Front and retest.

1.	**Remove MH-Front**	Follow instructions in Section B-1 to remove the MH-Front. Be careful not to accidentally disconnect blue connectors attached to the emitter and detector pins.
2.	**Remove Old Switch**	Squeeze the plastic spring clips on the sides of the switch to force it out of the MH-Front. Do not remove the wires yet.
3.	**Connect New Switch**	Align the lighted half of the switch rocker toward the cradles. Disconnect each wire from the old switch one by one and connect to the same terminal on the replacement switch. Press the switch into the MH-Front. Refer to Fig. 1 wiring.
4.	**Attach MH-Front**	Follow instructions in Section B-4 to replace MH-Front.
5.	**Test Unit**	Perform tests/inspections found in Appendix.

G. Clock and/or Clock Battery

Abstract:

The clock assembly is easily removed with fingers. The battery is located on the underside of the clock module and can be replaced without tools. The clock module is held onto the back of the face-plate with three screws.

1.	**Replace Clock Battery**	Refer to clock instructions in Manual PN 767036, Pg 5 & 6 for replacing clock battery and changing time.
2.	**Remove Clock Module**	Remove clock assembly from 767 and turn over. Remove three phillips head screws and clock module will come out of face-plate. Use #1 phillips screwdriver. Set buttons can come off during disassembly.

3. Replace Clock Module in Face-Plate

Position buttons on module with holes in face-plate. Align clock module with opening in face-plate. Attach three screws. Set time and date and check function.

H. Third Handle Repair

Abstract:
It is not necessary to remove the third handle assembly from the 767 unit to service it. The front housing of the third handle can be removed by removing four screws from the back of the unit. (Not the four screws that hold the metal extention bracket on). Removing the front housing provides access to the handle assembly connection at the circuit board. Torque all screws to 4.5 +/- .5 in. lbs. Connector and wire pattern is the same as for the main unit. The third handle does not use plastic washers under the board holding screws.

1. Remove Front Housing

Remove four screws from the back of the unit. Use a phillips #2 screwdriver**.** Position the 767 third handle assembly units back and separate the MH-Front from the MH-Back. Take care not to pull the housings apart abruptly as this may result in pulling the wires and connectors. This might unplug them from the components to which they are attached.

CAUTION > > >

Do not pull the blue two-pin female connectors off of emitter and detector unless you have to. When reattaching connectors to components, (if the connectors do unplug from emitter and/or detector accidentally), reconnect them per Fig. 1. Any combination of improper connections IE: reverse polarity or crossing the detector wires over to the emitter or vice versa will destroy these components and or PC board components.

2. Unplug the Handle

Disconnect the handle assembly molex connector (brown 4-pin female) from the pins on the circuit board. Replacing just the handle cord connector is not recommended.

3. Plug in the Handle Note the colors of the wires on the plug of the new handle assembly. Match the colors of the wires with the color coding printed on the circuit board at the pins.

CAUTION > > > If the brown 4-pin female molex connector is plugged in wrong, then 8 DC volts will be available at the handle and cause the lamp to fail immediately. Position the strain relief in the cutout of the MH-Back with the long edge of the strain relief resting on the circuit board. (The front and back housings will not fully close if the strain relief is any other way).

3. Remove Cradle Assembly Follow instructions in Section E, Pg. 6 & 7 , to remove and replace cradle.

4. Remove Circuit Board Remove two phillips head screws from the center of the board. No plastic washers are used on the third handle circuit board.

5. Replace Circuit Board Align replacement board in back housing with contacts in slot of back housing. Attach with two phillips screws.

6. Restore Connections Follow instructions in Section B-3 to attach the handle assembly. Follow instructions in Section E-3 to attach replacement cradle to front housing board.

NOTE: When plugging the molex connector of the handle assembly into a third handle circuit board, align the white wire with the top pin marked “white”. (The third handle circuit board is different than the main 767 board in that the handle assembly plugs in to the left. This requires that you flip the connector over in order to make the proper connection. Align the white wire contact with the words “white” at the top of the pins. Upside down connector will cause lamps to fail.

7. Install Front Housing Align the front housing over the back housing and attach with four phillips head screws. Tighten to 4.5 +/- .5 in. lbs.

8. Test Unit Perform tests listed in Appendix: Determine that handle output is the same for the main unit. Make sure the third handle is mounted securely with all four screws.

Third Handle Checks

1. Use main unit as a power supply for these checks. Provide nominal voltage (7.0 V RMS) to third handle assembly.

2. Handle output should be the same as for the main unit. Use fixed and variable in parallel resistors as shown in Appendix.

3. Perform functional check of handle rheostat. Look for smooth typical operation.

4. Articulate coil cord. Look for intermittent connections.

Appendix

Inspections/Tests for Repaired 767 Transformers
Main Unit and Third Handle

IMPORTANT: When any primary component is replaced, perform the leakage current test and the dielectric breakdown test as per the following specifications.

When checking the main unit, use Welch Allyn Tester T-13251 for leakage and dielectric strength tests. Measure output by using standard components / bench equipment set up as described below for the main unit.

1. Apply the calibrated *resistance to the handle stud to simulate a controlled lamp resistance. This may be supplied by using a fixed resistor and a variable resistor (pot) in parallel.

*** Calibrating the 767 Test Load**

The 767 functional test consists of measuring the voltage delivered by the 767 lamp driving circuitry when a calibrated resistance or load is put in the circuit instead of a lamp. The method for building the calibrated load is as follows:

a) Connect a 5 ohm potentiometer or an equivalent combination to obtain the desired nominal lead.

b) Connect a regulated 3.5 volt supply (ac or dc) to the load through an amp meter and adjust the potentiometer until the current delivered is 750 mA. (This will effectively be a circuit with a 4.66 ohm nominal load).

c) This resistor combination including the current meter is the calibrated load which should be applied when measuring the 767 output. Alternately T#13251 can be used.

2. Adjust input line voltage for domestic 767: 116 VAC+9 / - 3 VAC RMS.
   Adjust input line voltage for international 767: 230 VAC+/- 10 VAC RMS.

3. When handle is connected to test load circuit above, output (Rheostat Full On) of the 767 should be 3.5 VDC +/- .5 VDC. (Use a true RMS meter set on DC scale).

4. Measure third handle outlet output at the slot jacks on the right end of the 767 main unit. When measured with a Beckman (or equivalent meter) set on the AC scale, this output should be 7 VAC +/- 1 VAC with a nominal load of 9.33 ohms.

5. Measure leakage and hi-pot (dielectric strength) with tester T-12351. Follow instructions for tester.

6. Perform functional check of handle rheostat. Look for smooth typical operation.

Third Handle Checks

1. Use main unit as a power supply for these checks. Provide nominal voltage (7.0 V RMS) to third handle assembly.

2. Handle output should be the same as for the main unit. Use fixed and variable in parallel resistors as in steps 1, 2, 3, & 4 above.

3. Perform functional check of handle rheostat. Look for smooth typical operation.

4. Articulate coil cord. Look for intermittent connections.

Summary of Tests:

Safety

1. Perform leakage current and dielectric breakdown tests:
    1. Dielectric strength: 1500 VAC for 1 second. Unit should withstand application of 1500 VAC for 1 second between parts noted below without degradation or breakdown of isolation. Trip current not to exceed that induced by a120,000 ohm load:
       Primary to Secondary
       Primary to accessible dead metal
       Primary to ground

    2. Ground leakage current: less than 50 micro amps. With 120 VAC 60 Hz input and ground securely connected, leakage current as measured with circuit as shown on page 8 of owners manual, from secondary to ground should not exceed 50 micro amps.

2. Measure output of handles under load.
3. Check on-off function of power switch.
4. Check pilot light function of power switch.

Fit and Function

1. Check fit of heads on handles.
2. Check that light turns on and off automatically when handle is replaced in cradle.
3. Check for sufficient range of illumination (output).
4. Check tightness of third handle attachment if so equipped.
5. Flex each cord and check for intermittent light output.
6. Check for clear photo-optic windows in cradles.

Appendix
Tools/Materials/Supplies

Flat Blade Screwdriver (1/4”) with 6” Shank
(Stanley 65-322)

#1 Phillips Screwdriver

#2 Phillips Screwdriver with 6” Shank

Antistatic Mat and Wrist Strap

True RMS Digital Volt Ohm Meter

Lead Kit for Meter

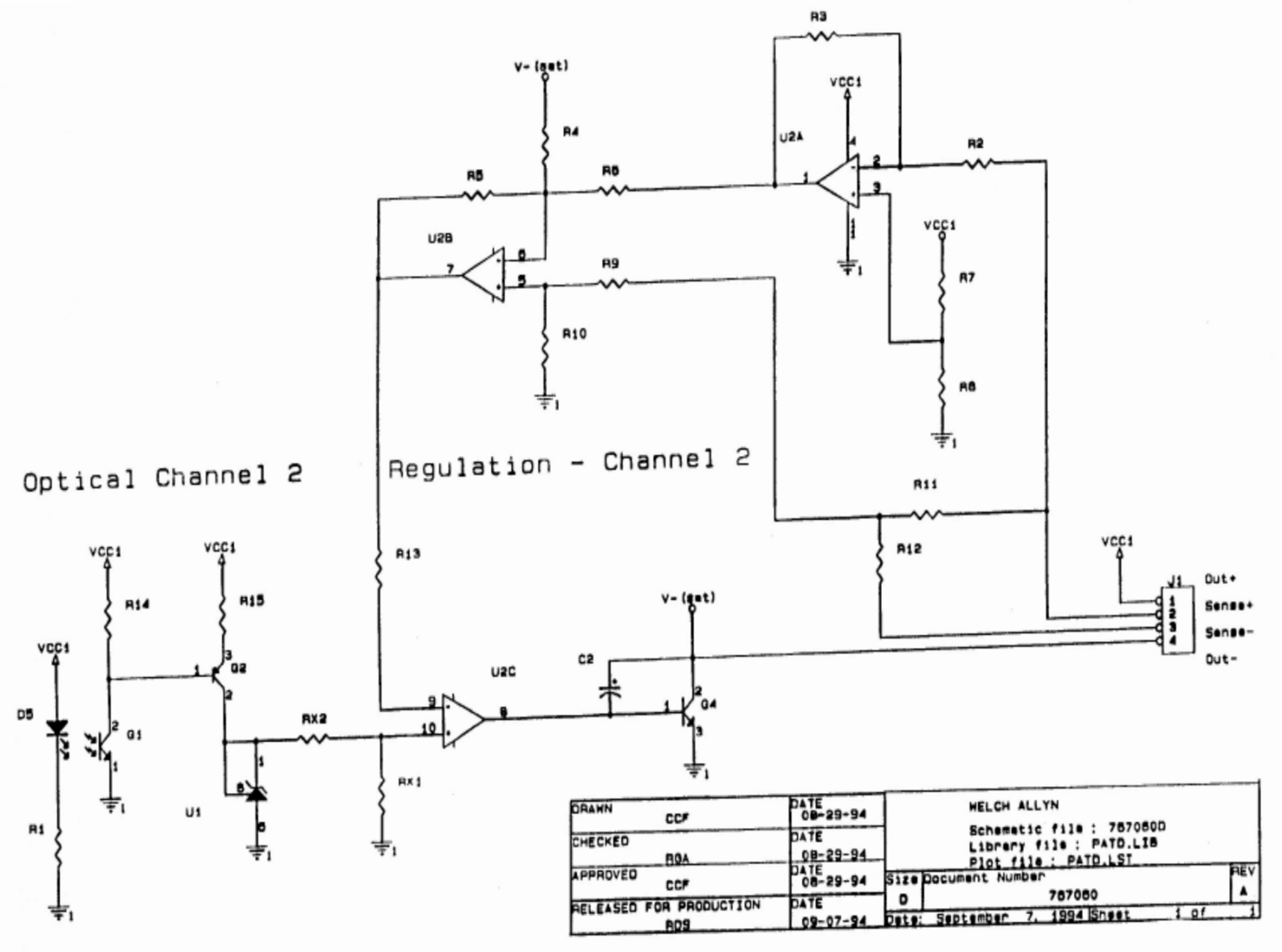
Long Nose Pliers

Tweezers

Thermal Crimper

Wire Stripper

Electrical Tester Welch Allyn T-13251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Regulation - Channel 2
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V- (set)
VCC1
R4
U2A
R2
R5
R6
U2B
R9
R7
R10
R8
R11
R13
R12
J1
Out+
Sense+
Sense-
Out-
C2
U2C
Q4
R14
R15
Q2
D5
Q1
RX2
RX1
U1
R1
DRAWN CCF DATE 08-29-94
CHECKED RDA DATE 08-29-94
APPROVED CCF DATE 08-29-94
RELEASED FOR PRODUCTION RDS DATE 09-07-94
WELCH ALLYN
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Plot file : PATD.LST
Size D
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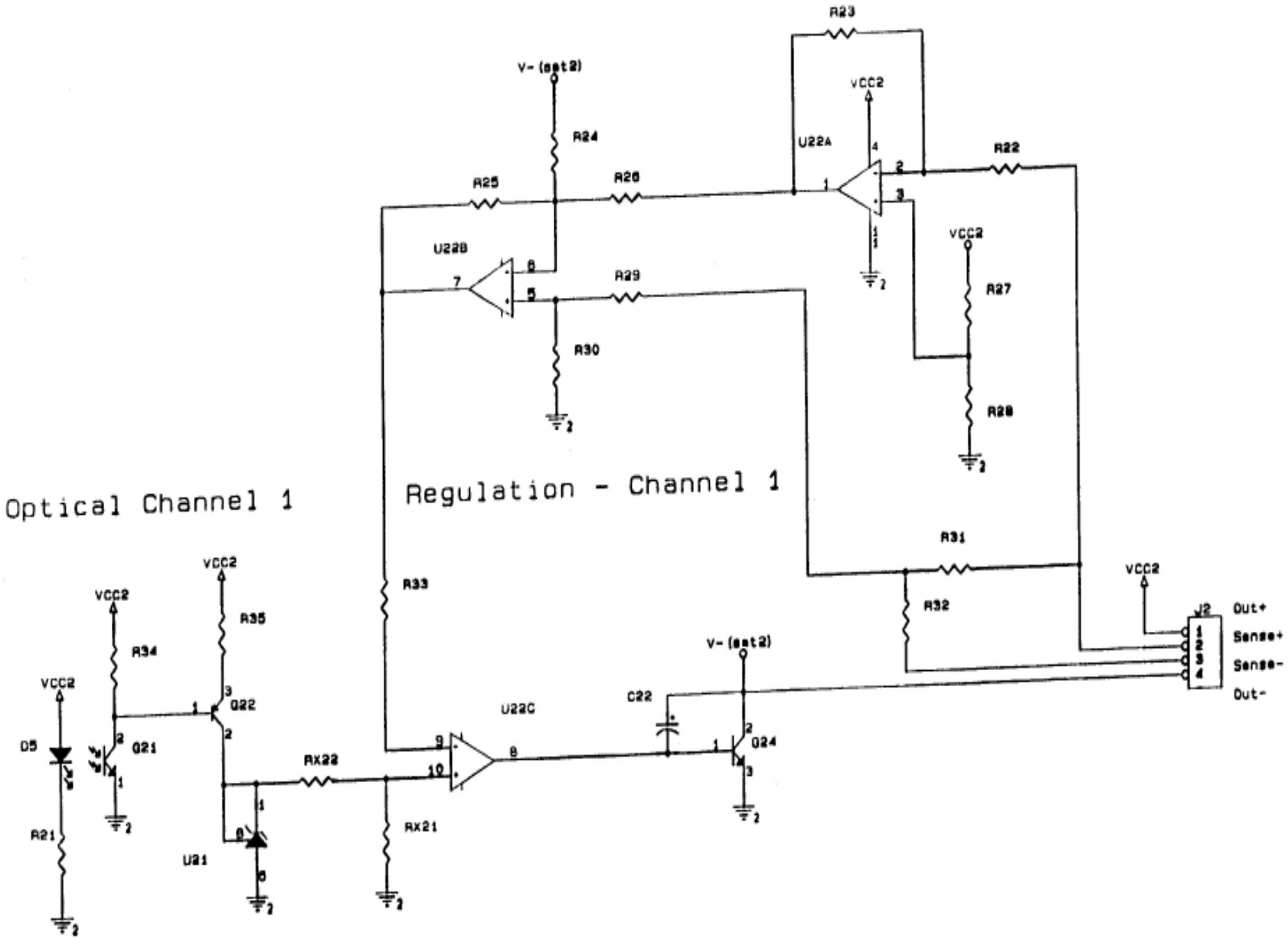
REV A
Date: September 7, 1994 Sheet 1 of 1


Optical Channel 1
Regulation - Channel 1
R23
V- (set2)
R24
VCC2
U22A
R22
R25
R26
U22B
R29
R27
R30
R28
R31
R33
R32
VCC2
J2
Out+
Sense+
Sense-
Out-
VCC2
R34
R35
VCC2
D5
Q22
Q21
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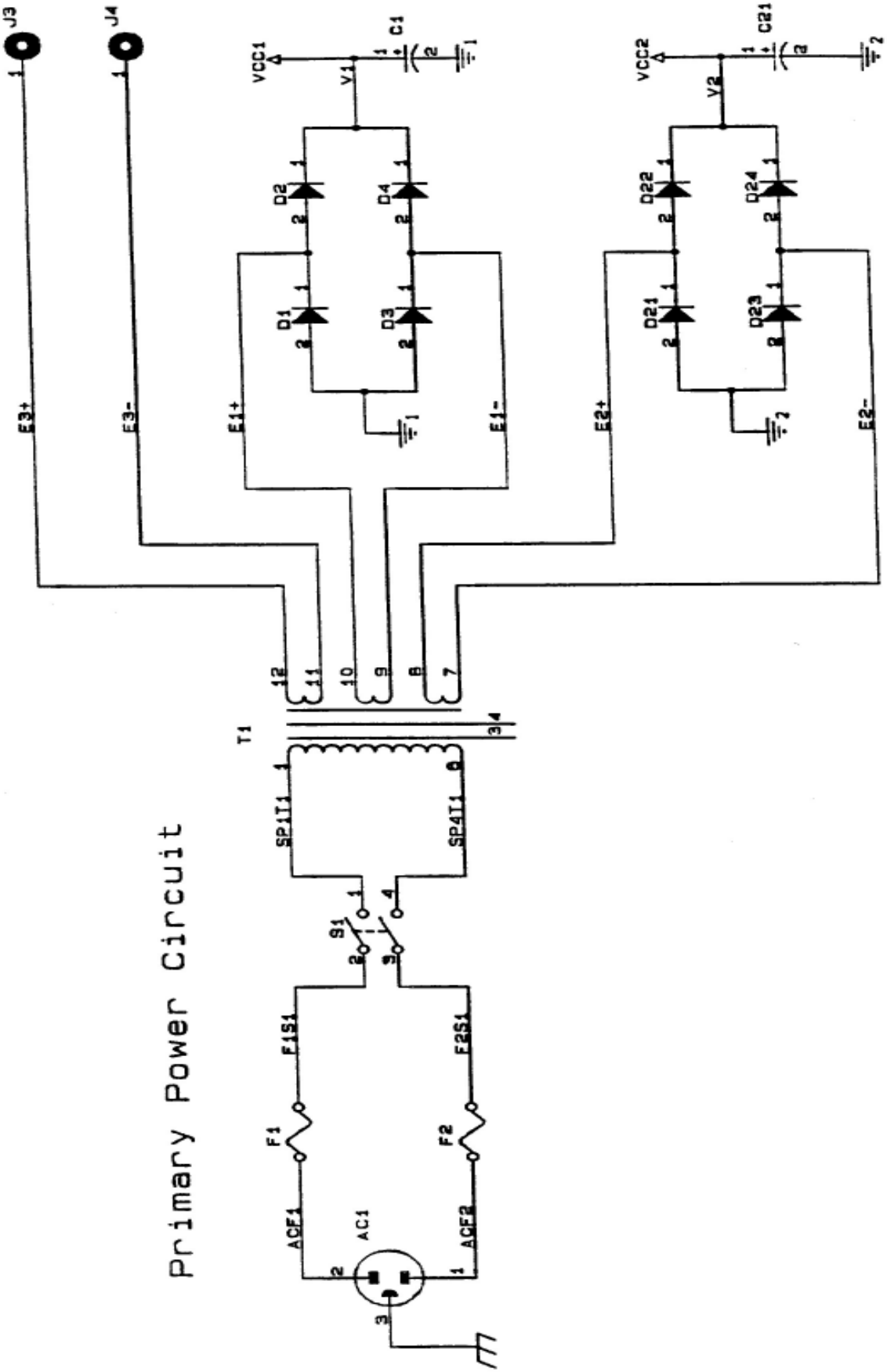
C22
V- (set2)
Q24
RX22
RX21
R21
U21


Primary Power Circuit
J3
J4
VCC1
C1
V1
VCC2
C21
V2
D1
D2
D3
D4
D21
D22
D23
D24
E3+
E3-
E1+
E1-
E2+
E2-
T1
SP1T1
SP4T1
S1
F1
F2
F1S1
F2S1
ACF1
ACF2
AC1